FLIGHT
and
AIRCRAFT ENGINEER

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The Outlook

Air Defence

EQUIPMENT and manning were the two subjects around which centred most of the House of Commons debate on the Air Estimates for 1949-50. The Secretary of State for Air was able to announce that orders have been placed for a twin-jet night fighter and a twin-jet interim-period jet bomber, and that the strength of Fighter Command's jet-fighter force is to be doubled. The exact meaning of this doubling was challenged, and the statement was not contradicted that it merely meant two flights for each squadron instead of the one to which the squadrons had been reduced—in other words, that the squadrons are to be brought back to strength.

In the absence of any official statement as to the number of squadrons in Fighter Command, the effect of doubling of the number of fighters cannot be fully assessed, but at least the effectiveness of the Command will be very greatly increased by having double the number of jet fighters by next year.

While one must applaud the placing of an order for a jet-propelled night fighter, there does appear to have been an unnecessary delay in arriving at this decision. By the end of the German war it must have been quite obvious that such a machine would be needed. The Vampire and the Meteor were in existence, and their value as day fighters was not in doubt, but for night interception a second crew member was essential for handling all the equipment involved.

It cannot be said that the Debate elicited any great degree of assurance so far as the bomber position is concerned. The twin-engined jet bomber to which Mr. Henderson referred has not yet flown, and so even this interim-period type is by way of being a long-term project, not to mention the more distant type which Mr. Macmillan called a "dream bomber."

If, unfortunately, war should be forced upon us in the near future, we should have to rely upon the Lincoln, manufacturing production of which has ceased, although it is to be assumed that numbers will have been taken out of storage so as to incorporate any applicable developments and equipment found desirable as a result of experience since the type was first introduced.

Actually the position is probably not quite so serious as might be imagined. There is little doubt that in case of a European war in the near future, this country would become a carrier for American bombers, some of which might well, in a fairly short time, be manned by British crews, thus supplementing our Lincolns. Our American friends have recently demonstrated, with the aid of British equipment, that ultra-long ranges can be attained by means of refuelling in the air, and, so long as the nations of Western Europe are not driven back to the sea, refuelled bombers could strike well into enemy territory.

Manning the R.A.F.

ULTIMATELY the realization of the Government's defence plan will, as the Secretary of State pointed out, depend upon the manpower problem. He admitted that we are faced with serious difficulties. This year, he stated, 80,000 men and women are leaving the R.A.F., so that no matter how many recruits come in, there will be a shortage of N.C.O.s with the necessary background of experience of management and leadership. Mr. Henderson added that all that could be said was that the position is better than it was, but still far from satisfactory.

The ventilation of grievances, and the suggestions for improvements, in which *Flight* has taken some part, has undoubtedly served to focus attention on service in the R.A.F., and there are signs that useful results have been achieved, and that efforts have been and are being made to improve matters. The Under-Secretary

of State for Air was able to assure the House that the standard of man management and leadership among general-duties officers is improving rapidly, and that the days of a demobilizing R.A.F. are past.

There is no denying the fact that much remains to be done, but a start has been made and things are moving in the right direction. The present unbalance, which has resulted in a surplus of N.C.O.s in the skilled aircraft fitter trades and a shortage of experienced Regulars in the radio trades, will take some time to put right, but now that the country is alive to the position there is reason to hope that a better balance will be achieved.

Much will depend upon the time factor. Given another year or two, the R.A.F. will become once more the salt of the earth. And if, unfortunately, war should come sooner, the spirit of the wartime R.A.F. is still very much alive inside and outside the Service, as was so well-shown by the recent Bomber Command Reunion and Pathfinder dinner. Should the need arise, the call would not go out in vain.

E Pluribus Unum

THEORETICALLY at any rate, satisfaction must be expressed at the agreement reached by eight Governments on the text of the Atlantic Pact. By far the most significant aspect is, of course, the fact that, for the first time in history, the United States of America declares beforehand that it will stand solidly behind the nations of Western Europe in their determination to defend their way of life.

It still remains to be seen how Russia will react to the Pact. She may decide that ideological infiltration will achieve her aims and that America's possession of the atomic bomb represents too great a risk. The next few months should show whether that is to be her answer, or whether she decides to strike before the European signatories to the Atlantic Pact can establish sufficient cohesion and organize their defences.

On the whole, it appears probable that Russia will decide to follow the former course. In that case she would, by forcing the Pact nations to divert money and effort to the production of armaments, delay to some considerable extent their recovery and thus prepare the ground for the spread of her doctrines in at least some of the countries in which Communism already has adherents.

If, on the other hand, she is determined to have a war, it would not be difficult to stage an "incident." Firing on one of the aircraft taking part in the Air Lift to Berlin would, according to the American Secretary of State, Mr. Acheson, be regarded as an armed attack.

CONTENTS

Outlook	331
Viscount "700"	333
Short-range Airline Speed	334
Here and There	336
The Third R.A.F.	338
Marking the Peacetime Target	340
Civil Aviation News	342
They Stoop to Conquer	345
Retrieving Glider Cables	348
Cutting the Cost	349
The Turkish Air League	350
Specialized Capacity	352
Airscrew Design	354
Correspondence	355
Service Aviation	357

Forthcoming Events page 347

Jewish Spitfires

FURTHER light has been thrown upon the shooting-down of British Spitfires last January by Jewish aircraft. In a written answer in the Commons, the Secretary of State for Air disclosed that the court of inquiry had found that the first Spitfire was brought down by fire from the ground, and that the others were hit by fire from Jewish aircraft while their pilots were concentrating attention on the pilot who had baled out. It has also been established that our aircraft were on the Egyptian side of the border at the time, and that they carried loaded machine guns, with permission to fire in self-defence.

It is bad enough that such impudence should be displayed by the Palestine pilots, but what makes the whole affair even more surprising is that the Jewish aircraft were Spitfires with British camouflage and red spinners, thus giving the impression that they were R.A.F. machines. Further comment appears superfluous.

TEEING UP: At Baginton, near Coventry, the first Armstrong Whitworth Apollo (four Armstrong Siddeley Mamba turboprops) is undergoing power-plant ground-running checks prior to taxying trials. This first open-air view of the new A.W. medium transport shows the amazingly small diameter of the Mamba nacelles.

VISCOUNT "700"

Lengthened Fuselage, Greater Span and Latest Rolls-Royce Darts Permit Increased Payload

The increase in overall dimensions has certainly not marred the appearance of the Viscount. Proportions in fact, are little affected.

ON that most agreeable occasion when *Flight* first tasted the joys of travel in the Vickers Viscount, Mr. George Edwards, its designer, intimated that he was pondering a larger version. Such a machine, he believed, would appeal to a greater number of airline operators than would the present Viscount, impressions of which were recorded in our issue of December 30th, 1948. This delightful prototype, it is learned, continues to behave in an exemplary manner, but has yet to complete its pressurizing and de-icing trials.

The Viscount 700, as the new model is designated, will take advantage of the increased output of the 1,420 h.p. Rolls-Royce Dart RDa 3 turboprops, and will be characterized by a larger fuselage—6ft 8in longer than that of the prototype—and a wing of 94ft span (an increase of 5ft). The lengthened fuselage will allow an increased payload, but the larger span necessitated is not expected to affect the excellent handling characteristics. Despite an increase in gross weight to 48,000 lb, the wing loading—at 49.8 lb/sq ft—is slightly lower than that of the present prototype. The track and wheelbase of the nosewheel undercarriage are both increased.

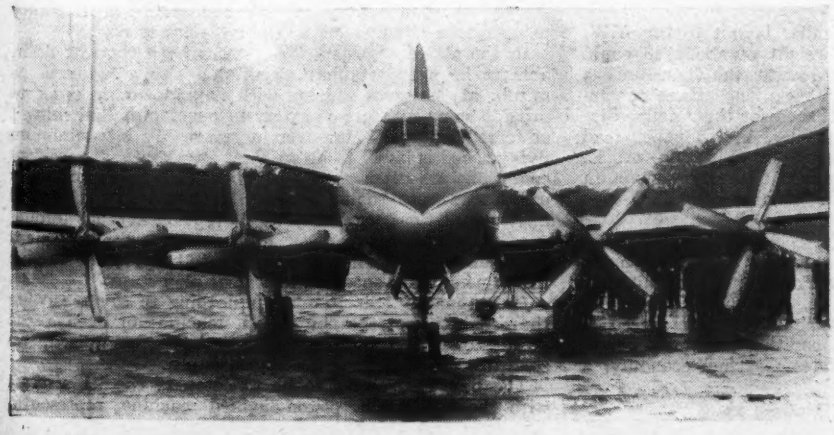
Two variants, known as the Model 40 and Model 52, will seat respectively 40 and 53 passengers—an important advance on the prototype which accommodates 32 to 43, according to layout.

The accompanying drawing shows that the deep oval windows are retained. Not only are they extremely efficient from the structural standpoint, but they are a great convenience and comfort to passengers, each being unusually large in area and forming an emergency exit.

VICKERS VISCOUNT 700
Four Rolls-Royce Dart RDa 3 Turboprops (4 x 1,420 h.p.)

	Viscount 700	Present Prototype
Dimensions		
Span	94ft	89ft
Length	81ft 2in	74ft 6in
Height	26ft 9in	26ft 9in
Track	26ft 1in	21ft 1in
Wheelbase	24ft 9in	21ft 5in
Wing area (gross)	963 sq ft	885 sq ft
Weights		
Max. take-off weight	48,000 lb	45,000 lb
Max. landing weight	45,500 lb	42,500 lb
Wing loading at max. take-off weight	49.8 lb/sq ft	50.8 lb/sq ft
Wing loading at max. landing weight	47.2 lb/sq ft	48 lb/sq ft
Capacities		
Fuel capacity	1400 gall	1200 gall
Performance		
Cruising speed at max. take-off weight on 68 per cent power at 20,000ft	274 knots (315 m.p.h.)	280 knots (322 m.p.h.)
Cruising speed at 85 per cent take-off weight on 68 per cent power at 25,000ft	283 knots (327.5 m.p.h.)	290 knots (333 m.p.h.)
Air miles (nautical) per gall, mean weight, at 25,000ft	1.26	1.3
Air miles (statute) per gall, mean weight, at 25,000ft	1.45	1.5
Take-off distance to clear 50ft at max. take-off weight, I.C.A.N. still air, I.C.A.O. technique	1,146 yd	1,030 yd
3-engine take-off to clear 50ft at max. take-off weight	1,375 yd	1,300 yd
Landing distance from 50ft at max. landing weight in still air and I.C.A.N. conditions	900 yd	900 yd
Service ceiling at max. take-off weight :		
(a) all 4 engines operating	30,000ft	32,500ft
(b) one engine inoperative	23,000ft	26,000ft

Representatives of some of the most important home and overseas airlines have displayed interest in the Viscount and many have enjoyed demonstration flights. The silence and lack of vibration, of course, have evoked special praise. A popular test for vibration during flight is to stand a pencil on end upon one of the tables and to time the period it remains erect. The record of twenty minutes is held by the designer's own pencil—of the common propelling variety.



The frontal aspect of the Viscount 700 will differ little from that of the prototype, shown here, except that the wheel track is increased.

"Flight" photograph

Short-range Airline Speed

Pistons versus Jets : The High Cost of Saving a Few Minutes

By L. H. W. HARRIS

AIR COMMODORE SIR FRANK WHITTLE is to be congratulated on his recent thought-provoking lecture, *London to Paris by Jet Plane*,* which will, no doubt, be studied by everybody interested in the development of air transport. His conclusions asserting so definite a superiority of the pure jet aircraft for short ranges are startling, and not yet widely held. Whilst, therefore, it may seem foolhardy to cross swords with the man whose pioneering work in the field of jet propulsion has made his name a household word, I nevertheless venture to take up cudgels to protect the decrepit, present-day aircraft with its "nasty up-and-downer" engine, from his sustained attack.

In order to arrive at a figure for the structure-weights of piston-engined aircraft and of a pure-jet-engined type, the Air Commodore takes as respective patterns the Airspeed Ambassador and Avro C-102. He works on a figure of 35 for the percentage structure-weight of the piston-engined aircraft at cruising speeds of 200 m.p.h., 250 m.p.h., 300 m.p.h., and 350 m.p.h., and a figure of 34 for the jet types at cruising speeds of 300 m.p.h., 350 m.p.h., and 400 m.p.h.

However, it seems hardly fair to assume that the structure-weight remains constant over such a wide range of speeds, since, to take one example, the air loading of the 400 m.p.h. machine will be 1.77 times that of the 300 m.p.h. type. Readers will doubtless recall that the Tudor VIII is restricted to a speed of 350 m.p.h. due to the strength limitations of the airframe, whereas the four Nenes would be capable of giving it a speed of something like 480 m.p.h. In any case, the choice of aircraft for the estimation does not seem very suitable, since the high aspect ratio of 11.5 for the Ambassador's wing, and its high position relative to the fuselage, are both features which make for increased structure-weight as compared with the moderate aspect ratio (8.3) and low wing-position of the C-102.

The Bristol Centaurus-engined Airspeed Ambassador.

In other words, in the writer's opinion, if the specification to which the Ambassador was built had been fulfilled by a design of similar layout to the A.W. Apollo, a percentage structure-weight of about 28 could have been realized as compared with the figure of 35 quoted by Sir Frank for the Ambassador. These conclusions are borne out by data published for the Apollo, Lincoln and Constellation. Incidentally, in his paper read at the Anglo-American Conference in 1947, Mr. A. E. Raymond, of the Douglas Aircraft Company, gave an estimated 5,650-lb increase for a "high-wing" D.C.-6.

Speed

Turning to the question of speed, a little arithmetic shows that to cover the London-Paris trip in 30 minutes, as suggested by A. Cdre. Whittle, would, assuming most efficient stacking, demand a maximum cruising speed of 600 m.p.h.! Assuming that an operating height of 25,000ft would be demanded in the interests of fuel economy, a Mach number of 0.87 would be attained, bringing with it a host of problems.

If we consider an aircraft of 55,000 lb gross weight—to take a similar figure to that used by Sir Frank—it appears doubtful whether, with our present knowledge, such a machine could be designed for economical operation; it is interesting to note that the Meteor IV has a limiting Mach number of 0.80. Moreover, although the Boeing XB-47 Stratojet has been designed for a Mach number of 0.95, there is no indication that it has approached this figure and, in any case, its fuselage is hardly suitable for the economical carriage of passengers.

Weight

A rough estimate indicates that, assuming a very clean aircraft, with very thin swept-back wings, a total of 32,000 lb of thrust would be required to give such a performance (this assumes the retention of a reasonably low stalling speed). Such a preponderance of thrust would provide an installed weight of 17,000 lb, working on the figure of 0.53 lb/lb thrust which obtains in the case of the Derwent V installation for the Meteor, and this figure would represent a percentage power-unit weight of 30. A figure of 36 per cent for the structure-weight of such a machine appears to be a reasonable "guestimate" when allied to the figure of slightly below 34 quoted by Sir Frank for the C-102, which is designed to cruise at 400 m.p.h. To see how uneconomical such a machine would be, we shall compare it with a piston-engined aircraft of the same gross weight and designed for a cruising speed of 250 m.p.h. As discussed previously, a percentage structure - weight of 28 would seem to be readily attainable for the latter machine, whilst a figure of 18 per cent for the installed power of some 4,300 b.h.p. seems reasonable, assuming a supercharge to 20,000ft.

Thus it can be seen that the disposable load of the piston-engined machine is so much greater than that of the jet aircraft, even ignoring the large difference in fuel weights, that there can be little doubt of its ability to operate a commercial service at a lower cost.

In the above considerations, it has been thought desirable to keep the stalling speeds down to a figure of 78 m.p.h. at the gross weight, with flaps down, in order to provide some measure of safety in event of a "ditching" or forced landing. Moreover, a reasonably low minimum flying speed is likely to be an asset on a route where foggy conditions are often met. This condition is, of course, a disadvantage to the high-speed aircraft, since it is well known that the use of very thin swept-back wings implies a reduction in the value of the maximum lift coefficient and therefore a larger wing area has to be provided to give the same stalling speed as a normal plan form.

Unfortunately, Sir Frank has nothing to say regarding the economics of the 600 m.p.h. machine or even a 500 m.p.h. one; therefore, to discuss the points raised, we shall need to talk in terms of 400 m.p.h.

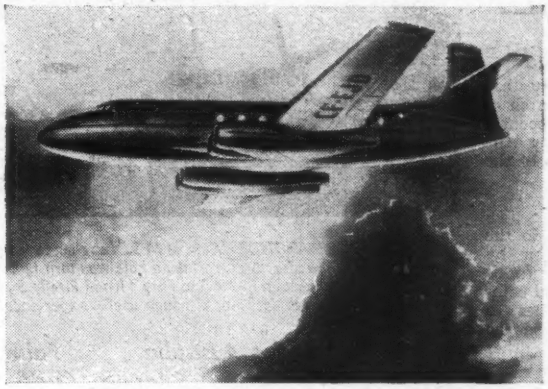
The best idea seems to be to compare the jet aircraft with the 250 m.p.h. piston-engined machine, representa-

* *Reported in "Flight" of February 10th.*

tive of the type in service to-day, and which has enough speed to satisfy the requirements of everyone who is not plagued by the speed bug. (In order not to confuse the issue, the propeller turbine will not be considered.)

Concerning the jet aircraft, a figure of 34 for the percentage structure-weight seems reasonable, since a wing larger than that of the C-102—whether fitted with efficient flaps or not—would be required in order to give the required minimum flying speed; then, assuming an aircraft of "Ambassadorial" cleanliness, a total thrust of 14,000 lb is indicated, which will account for a weight of some 7,700 lb or 14 per cent of the gross weight.

For the weight of crew, equipment, stores, and so on, a figure of 6,000 lb seems fair enough; but, unlike Sir Frank Whittle, the writer does not believe that any perceptible weight-saving in this connection could be achieved as a result of the jet machine reducing the time between the airport terminals by 10 to 15 minutes. These opinions take for granted a service run on commonsense and not luxurious lines.



The Rolls-Royce Derwent-engined C-102, built by A. V. Roe (Canada) Ltd.

From the above figures, we find that the piston-engined aircraft has a disposable load of 24,250 lb and the jet-engined machine a disposable load of 22,600 lb. Using Sir Frank's method, we find that the required fuel loads are 390 gall (say, 2,850 lb) and 1,122 gall (9,100 lb), so that the piston-engined machine has a theoretical payload of 21,400 lb and the jet type a payload of 13,500 lb.

The term "theoretical payload" has been used, since, in order to limit the number of different types required by an airline and provide a reasonably flexible machine, an effective range considerably greater than 200 miles, and a correspondingly smaller payload, would be primarily considered. However, if due consideration were given in the initial design, there is no reason why the slower machine should not carry a payload approaching the theoretical figure, made up of passengers, mail and freight; in any case, it is clear that it will enjoy a considerable advantage over the 400 m.p.h. machine in this respect.

Turning to the question of fuel, A. Cdre. Whittle's figure of 1s 2d per gallon for the cost of kerosene probably favours the jet unduly, since a large demand for kerosene would probably have the effect of raising its price, as the costs of the various fuels depend on the relative amounts in demand. In any case, the far larger amount of fuel required by the faster machine outweighs any saving in the cost of turbine fuel.

Although it is very common nowadays to hear kerosene acclaimed as much safer than petroleum, it must be acknowledged, in fairness to the piston engine, that this has yet to be proved in service. It should not be forgotten that the jet engine relies on the use of very high temperatures (600 deg to 850 deg C), figures which are likely to be increased with the development of higher-grade steels, and that the amount of fuel involved is very much greater.

Regarding the question of utilization, it is probably not generally realized that the figure for B.O.A.C.'s Constellations and T.C.A.'s D.C.-4Ms on the Atlantic route is from 2,500-3,000 hours per annum, so that Sir Frank's figure of 2,000 hours for the piston-engined aircraft could be suitably increased. It is, of course, quite possible that jet aircraft could improve on these figures, but it should be borne in mind that much heavier utilization would mean that services would necessarily be operated during the hours of darkness, which would probably be unpopular with passengers, and consequently give poor load factors. Moreover, maintenance would need to be carried out on a shift basis, which would be more expensive than normal working, and costs due to lighting and heating would be considerably increased.

A. Cdre. Whittle chooses the London-Paris route for consideration because, he says, "it is one on which it is particularly difficult to make a profit"; but he does not qualify the statement. There is, in the writer's opinion, no reason why the case should be as he claims it to be: there is always a heavy potential traffic offering, the distance involved does not entail the carriage of fuel at the expense of payload, and the weather likely to be expected can be fairly reliably forecast. In actual fact, Imperial Airways had reached the stage in 1939 when they could have operated the service without subsidy.

The foregoing notes should serve to show that the saving of a few minutes on a door-to-door journey lasting three hours or so has to be very dearly bought, no matter what present-day means of propulsion is employed.

It is well known that very high speed is uneconomical for commercial aircraft when the piston engine is employed, and even Sir Frank's figures show that it is cheaper to fly at 300 m.p.h. than at 400 m.p.h. with a jet.

Since the jet engine is acknowledged to be uneconomic for relatively low-speed propulsion, it is only reasonable to expect that any large increase over speeds in vogue to-day would be paid for by increased operating costs. When it is recalled that, at present, only a few of the world's airlines can show a profit, even when inordinate mail payments are made to them, any such increase cannot be justified.

LONDON AIRPORT FILM

A TEN-MINUTE documentary film about London Airport, made by the Crown Film Unit, is to be distributed to some 3,500 cinemas. It will also be shown by Government mobile projection units, and from May 1st it will be available on free loan from the Central Film Library, London.

The film was produced for the public, and an absence of technicalities is therefore understandable. Its opening scenes are particularly well-chosen; the airport is shown from an approaching aircraft, and R/T exchanges between the tower and a Trans-Canada captain complete the impression of arrival. One feels, however, that in the short time available some of the scenes of airfield construction might have been cut in order to show the airliners rather more intimately; and exclusion from the commentary of the names of even the most frequently used types suggests under-estimation of the public's interest in such matters.

INDUSTRIAL AIRFIELD

UNTIL 1946 the David Brown group of engineering companies used to charter aircraft for business flights; but they found the method inconvenient, and in October of that year acquired aircraft of their own. Since then no fewer than 1,500 passengers, from the managing director to maintenance engineers, have been carried on business flights not only in the British Isles but over most of Europe.

The aircraft were based at Sherburn-in-Elmet until, in 1947, the firm converted a stretch of moorland at Crosland Heath, only a mile from the Huddersfield headquarters, into a private airfield. A photograph of the fleet appears on p. 336.

The airfield—which, at 850ft above sea level, is the highest in England—now has emergency night-landing facilities. It has been placed at the service of other users, without landing-fee, and it is probable that a Belfast-Huddersfield "textiles charter" service will make frequent use of it.

HERE AND THERE

More Fireflies for Holland

THE Royal Netherlands Navy has taken delivery of a further batch of Firefly 5 fighters. They were recently flown to Holland from the Fairey Airfield at White Waltham by pilots of the R.N.N.

Trophy for R.A.F.A.

A TROPHY has been awarded to the Royal Air Forces Association by Shell-Mex and B.P., Ltd. It is to be put up by the R.A.F.A. for annual competition among the various branches, to encourage the competitive spirit in the achievement of its charitable and other work.

Australian Investment

ROLLS-ROYCE, LTD., has bought a £56,000 interest in the Commonwealth Aircraft Corporation of Australia. The Corporation, which was founded in 1936 and has an authorized capital of £800,000, is at present producing under licence Merlin 102 engines and Nene turbojets.

Change of Plans

THE Ministry of Supply has announced that at its request the Bristol Aeroplane Company will provide the complete crew for the Brabazon's first and subsequent test flights. G/C. Purvis, of the Ministry of Supply, will thus be replaced as second pilot by a member of the Bristol test team, to be nominated later. Mr. "Bill" Pegg—who, as mentioned on the next page, is in America—remains first pilot. G/C. Purvis will be the pilot in charge of M.o.S. trials after the Brabazon has been delivered to the Ministry.

TRIALS IN THE ARCTIC: When H.M.S. Vengeance entered the densely packed ice shown here, during the recent Arctic trials, a hole was torn in the bows of the carrier, making temporary repairs necessary. A Sea Fury 11 and Firefly 5 are visible in the foreground. Very little flying was possible, although useful experience was gained in other directions.

U.S. Rockets for Australia

FROM Australia it is reported that the United States may test rockets with atomic warheads on the Empire range at Woomera, Central Australia. America is said to have requested permission to use the test site through the British Government, as its own New Mexico range is too small. A joint agreement between the Australian, British and U.S. Governments, adds the report, would make Woomera the world's largest rocket-testing centre.

Junior Jet

ONE of the most interesting exhibits at the forthcoming Paris Show promises to be the French Fouga R.13—a single-seat aerobatic trainer, powered by a Turboméca jet unit of 176lb static thrust. The R.13, which has a wing-span of nearly 43ft, will have a retractable undercarriage and butterfly-type tail unit. Estimated maximum speed is 160 m.p.h. and the service ceiling is quoted as 32,800ft.

Fairey Draughtsman Honoured

THE Hele-Shaw Prize and Medal for 1948, the highest award of the Institute of Mechanical Engineers, has been won by Mr. Dennis Howe, a former engineering apprentice of the Fairey Aviation Company. On completion of his apprenticeship last year, Mr. Howe became a junior draughtsman and is now working on electrical-system drawings for new Fairey Naval aircraft.

Atomic Aircraft

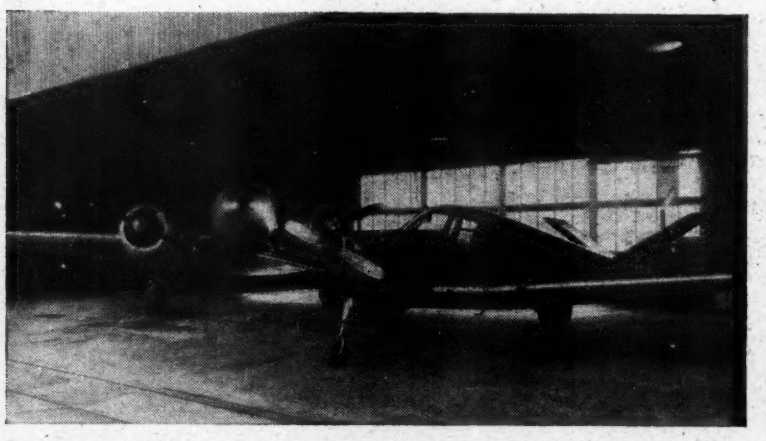
A MEMBER of the U.S. Atomic Energy Commission, Mr. R. F. Bacher, recently made the first mention of American plans for an aircraft powered by atomic energy. The Fairchild Corporation, he said, has been studying the possibility for two and a half years, under the supervision of the U.S.A.F., and in co-operation with the Commission. Their investigations are known as project "Nepa" (nuclear energy propulsion for aircraft).

Heaviest Deck Take-off

TAKING off from the U.S. Navy's carrier *Coral Sea* last year, with rocket assistance, a Lockheed P2V Neptune became the largest aircraft to fly off a carrier. Its take-off weight was then 55,000 lb. The performance has now been surpassed by a second Neptune which took off from a carrier recently at an all-up weight of some 74,000 lb, of which 10,000 lb was bomb-load. When an aircraft of this type set up the world's long-distance record of 11,236 miles in 1946, it took off, in 4,700ft, at 85,500 lb—27,500 lb over the Neptune's normal maximum weight.

Height of Efficiency

THE opinion that the 230ft-span B-36 bomber is the only known military aircraft which can operate efficiently at a height of eight miles (42,000ft) or more is said to have been expressed in a recent U.S.A.F. report to the American joint chiefs of staff. At this height A.A. fire becomes extremely inaccurate, it is claimed, and American jet-fighter pilots experience great difficulty in manœuvring for interception. (It should



WORKS TRANSPORT : David Brown and Sons, parent company of the big group of engineering firms, keep two Beechcrafts—an Expeditor and a Bonanza—at a private airfield only a mile from their Huddersfield headquarters. As related on p. 335, they have found aircraft of the greatest value. Since they purchased the machines they have flown some 120,000 miles in this country and abroad.

HERE AND THERE

be remembered that American jet fighters have relatively high wing loadings, and as high-altitude intercepters are inferior to current British types.)

On Stony Ground

ON behalf of nearly 5,000 employees, Gloster Aircraft shop stewards last week issued a statement dissociating themselves with a declaration by Mr. Harry Pollitt, the Communist leader, that he would organize strikes to prevent war against the Soviet Union. "As loyal citizens . . . we affirm our faith in the British way of life," said the shop stewards.

Saved, Sir!

RECENTLY, a Miles Messenger making a powered approach to Wolverhampton Airport encountered a most unusual hazard, in the shape of a football, alleged to have been kicked to a height of some 70ft from a neighbouring ground. The result was a disintegrated airscrew and an engine almost adrift, but the Messenger was put down safely by its pilot, Mr. L. Farrer. An uncharitable reader suggests that the M.C.A. may now ban private flying at airfields adjacent to football grounds.

Raising the Record

SINCE the U.S. Air Force recaptured the world's speed record from Great Britain in June, 1947, with a Lockheed F-80 (at 623.8 m.p.h.), it has met close "home" competition for the coveted honour. The U.S. Navy's Douglas Skystreak research aircraft raised the figure first to 640 m.p.h., and then to 650 m.p.h., in August, 1947, before the present record of 670.98 m.p.h. was established by Capt. Johnson of the U.S.A.F. in a North American F-86 last September.

According to *Aviation Week* the U.S. Navy now plans another attack, first with the Douglas Skyrocket, "swept" successor of the Skystreak, and then with the new Chance-Vought Cutlass XF7U-1 tailless fighter. Possible speeds of around 700 m.p.h. are mentioned. A prototype Cutlass has since been reported missing from a test flight.

OVER THE TOP: Jim Ryan, Piasecki chief test pilot, in the cockpit of the XHJP-1 helicopter. As described on p. 341, he recently made—more or less unintentionally—what is believed to be the first helicopter loop.

ENLIGHTENED: Watching a pressure-test of an Apollo cabin window—cadets of the Royal Air Force College, Cranwell, during their tour of the Armstrong Whitworth factory.

Cruiser Bombed

BOMBERS of the Chinese Air Force are reported to have sunk the 5,000-ton British cruiser *Aurora*, which was lent to China and taken over to the Communists by her crew.

New U.S. Amphibian

SIMILAR in layout and function to the Sponson Tribian, a new amphibian, the Aqua II, is being developed by the Aquaflight Company.

Appointment

MR. NORMAN ANDERSON, who was formerly chief designer to Sir George Godfrey and Partners, Ltd., has now been appointed chief engineer to the company. Since he joined them in September, 1946, he has been closely concerned with the design of aircraft cabin air-conditioning equipment, including Marshall pressurizing superchargers, refrigerators and associated apparatus.

Mr. N. Anderson

Slight Oversight

CONCLUDING a two-day conference at Scott Air Force Base, Illinois, twenty-five "met." experts of the U.S.A.F. found themselves marooned by a snowstorm none of them had forecast.

French Vampires

THE Société Nationale de Constructions Aeronautiques du Sud-Est is to build de Havilland Vampires under licence in France. A small number of British-built Vampires has already been delivered to the French Air Force, and, to build up squadron strength while Aero Sud-Est prepares for production, further "considerable quantities" will be supplied.

Initial arrangements provide for production of two Marks of Vampire—the "clipped" Mark 5 with Goblin 2, as built for the R.A.F., and the Nene-powered Vampire 51. The Nene is already being made in France under licence by the Hispano Company.

News in Brief

THE president of the Curtiss-Wright Corporation, Mr. W. C. Jordan, recently described Soviet air accomplishments as a threat to American air supremacy.

* * *

By means of a pedometer attached to her leg, an American airline hostess proved that she walks eight miles on an average flight from Chicago to Miami.

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Herr Willy Messerschmitt, the former German aircraft designer, is now specializing in prefabricated houses, according to Munich Press reports.

* * *

Mr. "Bill" Pegg—who is to make the initial test-flights of the Bristol Brabazon—left London Airport on March 14th for Fort Worth, Texas, where he is to fly the Convair XC-99 Brabazon-size transport. He may also pilot the Boeing Stratocruiser.

* * *

"The Bridge," a 15-minute documentary film showing the Air Lift, has been made in both German and English by the U.S. Information Service. It is to be shown in the three western zones of Germany and western sectors of Berlin.

* * *

Salvage of a U.S.A.A.F. Dakota from the River Witham by means of inflatable pontoons is one of the wartime incidents illustrated in an excellent war record produced by John Edgington and Co., Ltd., 108, Old Kent Road, London, S.E.1, who are specialists in canvas, cordage and associated equipment for a great variety of purposes.

* * *

Tickets (5s) are still available for the aviation colour-film show to be given in London tomorrow, March 25th, by Mr. William Courtenay and the Society of Licensed Aircraft Engineers (Finsbury Circus House, Blomfield Street, E.C.2), in aid of the Dorothy Spicer Memorial Fund.

THE THIRD R.A.F.

House of Commons Debates Air Estimates : Jet Fighters and Bombers

FOR eight hours the Air Estimates for 1949-50 were discussed by Parliament on March 15th. The House went into Committee on Supply at 4.18 and adjourned at 18 minutes after midnight.

Mr. A. HENDERSON, Secretary of State for Air, recalled that when he introduced the Air Estimates last year he told the House that we were engaged in building the third Royal Air Force. He now proposed to say something of the way that task was being tackled. They were, he said, working to a definite plan with a definite target, the objective being the creation of a force adequate in size and shape for the work it had to do in peacetime and for the tasks it would be called upon to do in an emergency. To do this, they must build up not only a highly developed organization for the close air defence of the U.K., but also a striking force which would be both a vital element in our defence and, as an offensive weapon, an effective deterrent.

The Air Minister announced that they were doubling the strength of Fighter Command's jet-fighter force (in reply to questions, that meant doubling the number of aircraft in each squadron). This statement was interpreted by some Members as meaning two flights per squadron instead of one. Expansion would not be limited to the defensive element, and they were now beginning to put into effect the first stage of the planned programme for increasing the front-line strength of the bomber striking force.

Dealing with the re-equipment programme, Mr. Henderson said the latest Marks of Meteor and Vampire fighters had a very much better performance than the original versions, and they were still the finest fighters in service in the world to-day. Nevertheless, replacement types were already under development whose performance would be as much in advance of present types as these were in advance of the first jet fighters.

Night Fighters

So far as night fighters were concerned, the Mosquito in its latest version was well able to deal with present-day types of night bombers, but night fighters of much better performance would be needed in the future. Orders had been placed for the production of a jet-engined night fighter which had been under development. It would have a speed approximating to that of our other types of jet fighters.

Last year he had mentioned that we were deferring the re-equipment of our bomber force with jet bombers until the new jet engines had been fully proved. At the end of the war they could either have developed at great cost a type of jet bomber built around existing jet engines, or gone in for developing a larger and heavier piston-engined bomber. Either course would have produced a bomber of limited and temporary value, which would have become obsolete in a short time. It was decided, at a time when the international situation was viewed in a different light, to concentrate on a long-term development of advanced jet bombers. But this development took time, and they had under development a twin-jet bomber less revolutionary than the one to which he had referred. This aircraft would have a speed approximately twice that of the Lincoln, that is, about 500 m.p.h. Orders had been placed for its production. The present position, therefore, was that orders had been placed for the production in quantities of a twin-jet bomber and a twin-jet night fighter.

Transport and G.R. Types

Other new types mentioned by the Air Minister were the Valetta medium-range transport to replace the Dakota; the first squadrons of Hastings were already in service; and the Shackleton, a new long-range general reconnaissance machine for Coastal Command, which had just made its first flight, and which was to be introduced into squadron service in the course of the year.

That was the plan, but its achievement would ultimately depend on manpower. Here they were facing serious difficulties. The position was that there were about 126,000 Regulars and some 102,000 National Service men in the R.A.F., making a present total of about 228,000. This large number would not be needed but for the unbalance of the trades and the shortage of experience. There were only 20,000 Regular airmen now in the Force which were serving in 1939.

The Secretary of State for Air then paid well-merited tributes to the work the R.A.F. is doing on the Berlin Air Lift, in Southern Arabia, in survey work for various Government departments at home and abroad, and in Malaya. He concluded by saying that the officers, airmen and airwomen engaged in the task of rebuilding the R.A.F. have the very real satisfaction of knowing that, by their own efforts, they are making a better Service, for themselves and for their country. These men and women deserved our grateful thanks and our support.

Mr. HAROLD MACMILLAN wanted to know the reason for the Government's excessive secrecy and thought too many engines and machines had been sold to doubtful customers. He also believed there were too many trade representatives of the U.S.S.R. and satellite states wandering around our factories. He asked if they might be told what the Government's plan was. Lord Trenchard had told the nation that a Commonwealth force of 180 to 220 squadrons was required. Did the Government agree in general terms? He was sure that every great Power knew the general position of our defences, and that every Air Attaché knew it too.

He agreed that the Berlin Air Lift was a very fine performance, but thought it must have put a great strain on Transport Command. He wanted to know if the Air Lift was intended as a permanent part of our life. As for re-equipment, last year they voted £48 million for aircraft and armament. This year it was £64¼ million. They had been told of more jet fighters and the development of new types, but the position was that the squadrons had previously been reduced to one flight each, and now they were being brought up to strength with two flights each.

The aircraft of our bomber force were becoming obsolete, and he did not see why we could not rearm with American Superfortresses in the interim until we got the new jet bombers.

Mr. SHACKLETON was worried about inter-Service liaison between operational units. How recently, for instance, had a naval officer visited a Coastal Command station such as St. Eval? He would like to know what part it was intended the R.A.F. should play in a possible war at sea. By the end of the last war the new types of German U-boats were such as to neutralize the effectiveness of aircraft. He feared we had not yet solved that problem. The system of regional commands was not entirely suitable for a global war, and he thought it would be necessary for the R.A.F. to consider the possibility of setting up world-wide commands.

Mr. GRANVILLE wanted to know how long it would be before we should have, in effect, an international air force with full co-operation with the Dominions, the Benelux countries and the United States, and he pleaded for greater standardization.

R.Aux.A.F. and R.A.F.V.R.

Mr. QUINTIN HOGG moved an amendment asking that immediate steps be taken to build up the strength of the R.Aux.A.F., to increase the number of Fighter Control Units, to provide more facilities for Volunteer Reserve Training, and to assist and encourage the flying clubs. He wished he could see some sense of alarm about the present state of our defences. When he went about the country and heard of nothing but free spectacles and dentures, while the question was whether our country would survive at all, he felt it was the duty of statesmen to create a little more alarm. In the R.Aux.A.F. there were, as regards personnel, 3,509 out of a target of 29,000. In the R.A.F.V.R. the figures were 4,459 out of a target of 38,000.

The R.Aux.A.F. ought to have 20 fighter squadrons, of which four should be equipped with jet aircraft. There should be 12 squadrons of the R.A.F. Regiment, 26 fighter control units, and six aircraft control sections. What did that mean in fact, when all that existed was 3,509 men and women? In the R.A.F.V.R. there was a shortage of schools and a pitiful inadequacy of aircraft. To train pilots on Tiger Moths was like training a tank driver on an Austin Seven.

As regards the flying clubs, Mr. Quintin Hogg admitted that when he was Under-Secretary he was not as impressed as he ought to have been. He now realized that the flying clubs formed an important part of our preparation for air defence.

Mr. ROLAND ROBINSON, who seconded the amendment, said in these days they saw the same signs of aggression as in

the 1930's. They asked that the R.A.F. should be strong and that its strength be shown in no unmistakable manner. It should train and co-operate with the air forces of the Commonwealth, of America and of the nations of Western Union, and there should be, as far as possible, standardization of equipment. He urged an immediate expansion of the R.Aux.A.F. and the R.A.F.V.R.

W/C. MILLINGTON said that as soon as demobilized men had found their place in civilian life, they began to ask how they could continue service with the volunteer forces. If that problem had been seized more firmly, there would have been a bigger recruitment. He thought it might be well to get the whole of the non-Regular air force on the Auxiliary basis. The R.A.F.V.R. could assist as a contribution to the great demand for flying clubs. He wanted to see the R.Aux.A.F. flying aircraft which had only just been replaced in the R.A.F.

W/C. HULBERT complained of the small amounts allocated to the Reserve Forces, and hoped R.Aux.A.F. squadrons would not be treated as poor relations. Prior to 1939 there was at the Air Ministry an Auxiliary officer with the title Honorary Director of the Auxiliary Forces. He served as a very useful liaison between the Ministry and the Auxiliary squadrons. That post should be revived. He complained that nobody knew what the future of the A.T.C. is to be.

Mr. A. HENDERSON then intervened to reply to some of the matters raised in the discussion on the amendment. He agreed with the needs of the R.Aux.A.F. but there were three requirements of the nations in the Western Union, and they had to balance available supply. Four of the 20 R.Aux.A.F. squadrons had been re-equipped with jets. Four more would be re-equipped in the next 12 months, and more would start in the following 12 months. Seven squadrons would be getting three Vampires for training purposes. The position with regard to ground crews was that they were about 65 per cent complete.

Fighter Control Units

Recruiting for the fighter control units began last October. An obstacle was their distance from towns. They were examining the possibility of tapping a wider recruiting field. There was also the difficulty of accommodation. The Royal Observer Corps had now attained a strength of 14,000. He agreed that the difficulty about the R.A.F.V.R. is that it is not organized in units. It was a pool of trained volunteer reservists, the aim being to have a body trained in flying and ground duties, ready to be fitted into the structure of the R.A.F. whenever needed in emergency. The strength at the moment was 4,000. Two hundred National Service pilots would go into the R.A.F.V.R.

Mr. DODDS complained that these debates were the happy hunting ground for R.A.F. officers, and thought some reality should be brought in by hearing the voice of the other ranks.

Mr. BOOTHBY said he sometimes wondered whether the defence organization established under the Brussels Pact was anything more than a facade. We might be trying to put up a bluff, and whatever else we might do to the Russians, we could not bluff them. He thought the will to resist existed in Holland and Belgium, but what about France and Italy? So far as France was concerned, she was not convinced that we meant business, that in case of trouble we would be prepared to give her cover. The European countries regarded the Berlin Air Lift as a remarkable technical achievement but a diplomatic humiliation. The only way to prevent war was to establish overwhelming air superiority and to establish it quickly.

Mr. GEORGE WARD said the trouble was not with the R.A.F. but with the politicians at the top, who did not give a clear lead. The Berlin Air Lift was a success because there was leadership at the top, there was a job to be done, they knew what it was, and they did it.

Dr. SEGAL put in a strong plea that the efficiency of the medical service of the R.A.F. should not be allowed to suffer, and that the medical branch should be allowed to recruit the keenest minds among the younger doctors.

Pay Increases

Mr. RAIKES did not think we should get the men needed until the pay question was completely altered. The increase in pay of the R.A.F. was 31 per cent compared with 1939, but in many industries it had been 80 or 90 per cent. Until we treated the R.A.F. as an undermanned industry we should not get the men.

Mr. DE FREITAS, Under-Secretary of State for Air, replied to questions raised. As for the plan for developing the R.A.F., this was flexible and subject to change with conditions in the Atlantic Pact and Western Union. The submarine danger was there, but there was some small comfort in the fact that when the submarines were using the "Snort" they were slow, blind and, in good conditions, could be detected by radar.

From Coastal Command stations there had been constant visits to and from naval units, R.A.F. men went to sea in *Illustrious*, and there was a highly important joint development school in Northern Ireland. At staff colleges and Central Fighter Establishment we had American Air Force officers, and at corresponding organizations in U.S.A. we had our officers. There were good opportunities for National Service men, some 800 commissions a year.

The question of young general-duties officers and man management was difficult, but they were tackling it, and the standard was improving rapidly. We should not think of the R.A.F. as a demobilizing air force. That was past. On the subject of training in the Empire, he mentioned the Rhodesian Air Training Group and said he looked forward to this becoming a model, not only for the R.A.F. but for Commonwealth co-operation in peacetime.

Brigadier LOW was anxious about R.A.F. collaboration with the Army. He wanted to know if the Tactical Air Force was fully accepted.

Mr. A. HENDERSON replied that there was very close co-operation, especially in Germany and the Middle East. B.A.F.O. had the essence of a Tactical Air Force. There was also the matter of co-operation in photographic reconnaissance, and, in the case of the Territorial Army, there were 20 flights of Air Observation machines.

R.A.F. RESERVES CLUB

THE R.A.F. Reserves Club has made an excellent start by gathering almost a thousand members in its first year of operation. With the main purpose of celebrating this achievement a "spring cocktail party" is to be held at 6, Stanhope Gate, Park Lane, London, from 1730 to 2000 hr on April 1st. This particular party will have to be limited to 200 and admission will therefore be by ticket (price 6s 6d), obtainable from the hon. secretary. Later in the month—on Friday, April 29th—a dance is also to be held at the Chenil Galleries, adjoining Chelsea Town Hall; for this event, also, tickets may be obtained from the secretary.

As many people will know, the R.A.F. Reserves Club is accommodated in a portion of the R.N.V.R. Club building at 38, Hill Street, London, W.1, but it is intended that the Club shall eventually have its own premises. The temporary facilities, however, have been made attractive, and all meals are available in the dining room. There is a members' bar on the second floor and a ladies' bar on the first floor, and overnight accommodation is available for about 50 members at 7s 6d a night. R.A.F. Reserves Club members are invited by the R.N.V.R. to join them in their many sporting activities, which include sailing, football, cricket and fishing.

The ultimate intention is that the scope of the R.A.F. Reserves Club shall be increased so that it can become a junior Royal Air Force Club, but at the present time membership is restricted to serving and ex-members of the Volunteer Reserve and Auxiliary Air Forces. It is hoped that, as in the case of the R.N.V.R. Club, an official grant will be be made to augment the official encouragement which has already been received.

CHANGES AT FAIR OAKS

NEW flying club premises, which include a lounge, bar, games room and separate billiards room, have recently been opened at Fair Oaks, near Woking, Surrey. They are situated on the airfield and adjoin the R.A.F.V.R. mess. The clubhouse on the hill overlooking the airfield has been closed.

On April 8th an R.A.F.V.R. dance will be held—the first since the change-over; tickets (5s single, 9s double) include buffet and transport from Woking Station. A club dance is also to be arranged in the near future.

YOUTH SEES FOR ITSELF

WHEN the 26 members of the Youth Forum—13 boys and 13 girls from various countries from abroad—visited Bristol last week they were entertained by the Bristol Aeroplane Company and B.O.A.C.: they saw the Brabazon, watched a display by a Brigand and the Type 171 helicopter, and witnessed the maintenance of B.O.A.C. Constellations. On the following day, in London, they inspected the air exhibit at the Ideal Home Exhibition, and met Sir Frank Whittle.

Marking the Peacetime Target

Lord Trenchard and Lord Tedder Call Upon the Pathfinders for a New Leadership

THE President and Council of the Pathfinder Association were the hosts at a dinner given at the Dorchester Hotel, London, on Friday, March 11th, as a prelude to the Bomber Command Reunion the next evening. As we briefly mentioned last week, in publishing a photograph of some of those present, Marshals of the Royal Air Force Lord Trenchard and Lord Tedder attended. They were welcomed by the chairman, W/C. J. C. MacGown, D.F.C., M.D., who said in his speech that it was a great honour and a landmark in the history of the organization to entertain them. All the guests, he remarked, were present because they were interested in the welfare of Servicemen and ex-Servicemen. He paid tribute to Lord Trenchard, of whom he said that it was almost time he was called "the grandfather of the R.A.F." W/C. MacGown also associated Pathfinders with General Eisenhower's remark concerning Lord Tedder—that he was lucky to have had his services and that he had won the respect and admiration of all. He was a good mixer and a good airman.

To Lord Rothermere and *The Evening News* (to which he added also the names of Mr. Guy Schofield, the Editor, and Mr. Cyril Birks) W/C. MacGown said "Thank you for making the Bomber Command Reunion possible." Another guest who was thanked for his co-operation in the organization of the great Reunion was Air Marshal Sir Robert Saundby, wartime deputy to Air Marshal Harris and, incidentally, chairman of the R.A.F.A. Finally, thanks were given to A. Cdre. A. S. Ellerton, Air Ministry, and Mr. MacBride and Mr. Parsons. The fact that the Albert Hall could have been filled twice over for the Reunion showed that the spirit was still alive, and the Pathfinder Association was glad to do anything it could to help that spirit.

Lord Tedder, speaking for the guests, first complained that he had had inadequate briefing when he was detailed to reply. He had no prior knowledge of the gaggle to whom he was speaking, but he could see there were some "heavies" present and also some "very light stuff." He was honoured to reply for the "first Pathfinder of the Air Force."

The C.A.S. said that he would give anything for the honour of wearing the Pathfinder symbol. Both low and high levels had taken exception to the wearing of the symbol—low levels, he suspected, for reasons of jealousy, and high levels probably through a mistaken sense of tradition. But that little symbol was worth more than a jewel to people who had earned the right to wear it. It might not be conventional but it was beyond price to the people who wore it and to the Air Force of whom they were a part.

Value of Pathfinder Association

Lord Tedder said that the object of the Pathfinder Association was to keep alive the comradeship of the P.F.F. and of a part of the Air Force. This was not just "an old boys' party for a line- and lie-shoot," but something constructive. It was grand in one particular way. Some were in uniform and some in strange garbs: he remembered meeting one recently at Gatow [a reference to A. V.-M. Bennett]. The particular value of the Association was to keep knitted together the R.A.F. in uniform and the part not now in uniform—in other words, to keep in touch. The Air Force wanted a lot of good types to come back and, frankly, the Berlin Air Lift was a great strain which would not normally be expected in peacetime. Some people, however keen, could not be taken back because they were too old. This was a great disappointment to them, but needed explaining so that they did not criticize the R.A.F. and the Air Council unjustly. Pathfinders should help to keep the public in touch also. In conclusion, Lord Tedder felt that some lines of Wordsworth were appropriate:

> "Who is the happy Warrior? Who is he
> That every man in arms should wish to be?
> It is the generous spirit, who, when brought
> Among the tasks of real life, hath wrought
> Upon the plan that pleased his childish thought:
> Whose high endeavours are an inward light
> That makes the path before him always bright:
> Who, with a natural instinct to discern
> What knowledge can perform, is diligent to learn."

Lord Trenchard, toasting "Bomber Command," said that he liked to think of himself as the child of the Air Force—"They made me—not I them." He was glad to feel that he had had something to do with the formation of the Air Force and of Bomber Command. It was not an invention, but was born with the Wrights. The principles were there in the 1914-18 War, but there was no equipment. The first war to be won by bombers was the Second Afghan War; it was a forerunner of what was going to be done by Bomber Command led by "that great man Bert Harris." No other man could have seen it through those difficulties. Also to Bennett, in and out of uniform, a great deal was owed. Bomber Command had had more to do with ending the war than any other force. Those out of uniform could give more help to those still in than those in uniform could to those out. Talk and propaganda could help and could do much to save us from another war. The work of the American 5th and 8th Army Air Force was just as essential. Day and night bombing must go on and both nations must share the work in order to understand each other's problems. Finally, he hoped that Bomber Command of the future would be as good as that of the past.

Air Marshal Sir Robert Saundby thought it was most appropriate that Lord Trenchard should propose the toast of Bomber Command as he was the first commander of the Independent Air Force which had attempted to bomb the Rhine area. The total at any time had been eleven squadrons of single-engined aircraft, but there had been considerable effect on German production. Bomber Command had been based on the operations of the Independent Air Force.

Bomber Command Losses

Sir Robert said that he considered this serious occasion no time to be telling stories. He recalled that 48,000 men of Bomber Command had not returned from operations and 8,000 more were lost on the ground. Looking back, he thought of the wonderful spirit of Bomber Command and of its unbreakable morale. One worry the Command had never had was that of morale. Although the heaviest casualties were being suffered there was no grumbling and no lessening of the offensive spirit.

It was true to say that the harder the work, the tougher the job and the heavier the casualties the better was the morale. The results of the air bombardment which included the contribution of the 8th Air Force, had not been so much quantitative as qualitative. It had put the Luftwaffe on the defensive with the result that it had lost the initiative in the air and lost its air superiority. In turn the whole of Germany's industry had been put on the defensive. Bomber Command had reduced the V weapon from a serious threat to an infernal nuisance. The climax of Bomber Command's effort was the landing and break-out from the invasion beaches. From then on it was just a help. Air Marshal Saundby thought that Stalin had not been sufficiently grateful for Bomber Command's help, which had made it possible for the Russians to resume their offensive on the Eastern fronts.

Air Marshal Sir Aubrey Ellwood was proud to have been associated with the first proposals for the Pathfinder Force and to have given it his support. He also remarked on the appropriateness of Lord Trenchard's presence and toast. The Independent Air Force had been an accurate forecast of strategic bombing conception. Referring to the vital part played by P.F.F. and Bomber Command in winning the war, he said that the Pathfinder technique was alive in Bomber Command to-day, and crews would apply it effectively if called on again. It was a reduced force to-day and comprised a highly trained nucleus on which to build. Methods were based on the wartime P.F.F. technique and present crews on exercises had made a good showing. This did not mean that there was any complacency, and all the time the aim was for greater accuracy and thus increased effectiveness. P.F.F. training was still in the foreground for the future and exciting developments were in view.

Air Marshal Ellwood said that he wished to correct an impression concerning morale in Bomber Command. There had been some misguided talk in the "dailies." There had always been grumblers—it was a healthy sign and it was unhealthy not to grumble. It was indicative of constructiveness instead of apathy. On his visits to stations he had noticed

absolutely no signs of low morale. This was representative of R.A.F. morale generally. Finally, he thanked Lord Trenchard and the Pathfinder Association and said "I assure you that Bomber Command will not let you down in future."

Air Vice-Marshal Bennett, who had flown a Tudor-load of diesel oil to Berlin in the morning and returned that afternoon by Proctor to be at the dinner, made several pithy and humorous remarks with reference to wartime Pathfinder exploits and post-war civil aviation. He said "Every time I try to drop a T.I. I drop a brick." There had been dark patches in 1941 but we did something about it. It was the same now, and something must be done. To Pathfinders he said "Forget the spoofs and dummies, press on—not quite regardless. To be keen is not enough; you must act."

Mr. Cyril Birks, proposing the toast of the Pathfinders and A.V-M Bennett, said that Air Marshal Bennett had led the Pathfinder Force with great distinction and success. The Pathfinder Association, like all Service organizations, aimed to perpetuate the wartime camaraderie. He mentioned that the Association had found employment after demobilization for 500 of its 3,000 members. He traced briefly the history of P.F.F. and A.V-M. Bennett's career, and concluded by thanking those who had given support and help in the organization of Bomber Command Reunion. To other names already mentioned he added, deservedly, that of F/L. Alec Thorne, secretary-general of the Pathfinder Association and organizing secretary of the Bomber Command Reunion Committee.

G/C. D. F. E. C. Dean briefly, but adequately, proposed the toast of "absent friends." The guests invited were as follows:—

Marshal of the R.A.F. Viscount Trenchard, Marshal of the R.A.F. Lord Tedder, Viscount Rothermere, Air Marshal Sir Robert Saundby, Air Marshal Sir Alec Coryton, Air Marshal Sir Arthur Sanders, Air Marshal Sir Richard Peck, Air Marshal Sir Aubrey Ellwood, Sir James Barnes, A.V-M. J. D. Brekey, Brig.-Gen. J. B. Ackerman, G/C. L. Cheshire, G/C. R. C. Vaughan, W/C. M. Smith, S/L. A. J. O. Warner, L. M. MacBride, Esq., Guy Schofield, Esq., W. B. Harbud, Esq., W. H. Parsons, Esq., E. A. Lister, Esq., G. R. Boak, Esq., Cyril Birks, Esq., Thurstan James, Esq, H. C. Drake, Esq.

Latest American Helicopter

Piasecki XHJP-1 Claimed to be World's Fastest and to Have Made First Helicopter Loop

FURTHER information is now available concerning the Piasecki tandem-rotor helicopter, pictures of which we published last week. This machine, it will be recalled, has tandem overlapping rotors, and three are on order. The first two have been undergoing tests at the U.S. Navy Air Test Centre, Patuxent River, Maryland.

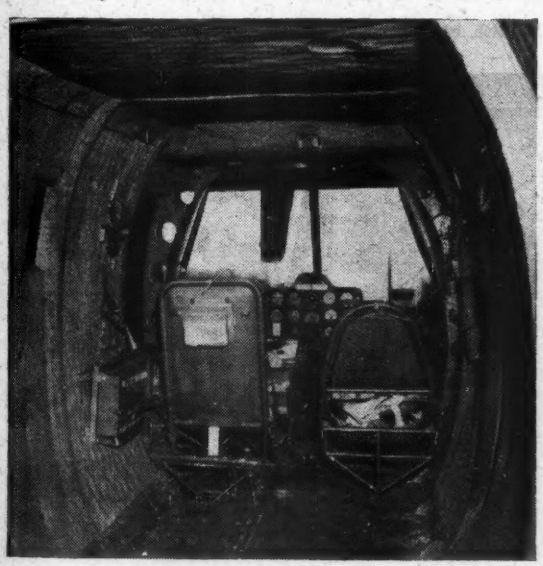
During tests at the Piasecki Helicopter Corporation's airfield at Morton, Pa, one of these machines made calibrated runs at 131 m.p.h. It is not disclosed whether this speed was an average of two runs in each direction, but in any case the flight was not officially observed, and so does not qualify for record purposes. Nevertheless, it is a praiseworthy performance, especially if one bears in mind that this helicopter carries five passengers, plus a crew of two, on a Continental engine of 525 h.p. During the speed run it probably carried pilot only, as did the Fairey Gyrodyne when it established the world's speed record of 124.3 m.p.h. The Alvis engine is of approximately the same power as that of the Piasecki, so, if this speed figure was not due to tail wind, there would appear to be advantages in the overlapping tandem-rotor arrangement.

The following performance figures are said to have been obtained with the XHJP-1: rate of climb with forward speed more than 1,600 ft/min; in vertical ascent 1,500 ft/min. At 75 per cent power the cruising speed is 114 m.p.h. As an overload test the machine has been flown with a useful load of more than one ton. Transition into autorotative flight has been accomplished at a range of speeds, including the maximum permissible, but no information is available concerning the loads with which transition was made.

One of the advantages of the overlapping tandem-rotor arrangement, apart from compactness, is that centre-of-gravity location is not critical, so that passengers can move about inside the spacious fuselage. The manufacturers state that "the rigid all-metal fuselage has reduced vibration to a new low for this type of aircraft." According to reports, there was room for improvement in that particular direction.

Main dimensions of the Piasecki XHJP-1 are: length with blades extended, 39ft 3in; with blades folded, 31ft 7in. Width with blades folded, 9ft 4in. The height is 12ft 6in with blades at rest, and with blades running there is clearance of 7ft above the ground or deck.

In doing a demonstration of the machine's ability to withstand high "g" forces, the Piasecki pilot, Jim Ryan (a photograph of whom appears on page 337) made what was probably the first loop in a helicopter. He dived to attain the required test figure for pull-out and applied full control. This put the machine into a vertical position, and Ryan decided the only thing to do was to continue through a loop. All went perfectly well, but Ryan said afterwards that he admitted "sweating a bit."



Pilot and co-pilot have an excellent field of view in the Piasecki XHJP-1 tandem-rotor helicopter now being tested for the U.S. Navy. It will carry five seated passengers or three stretcher cases, and c.g. location is not critical.

ACCURATE SURVEY PHOTOGRAPHY

TO photograph an area from the air a series of straight and parallel tracks must be flown. The distance between adjacent tracks is chosen to give a specified amount of overlap between the parallel strips of photographs, and this fact calls for highly accurate navigation, particularly on large-scale surveys. For example, at a scale of 1:2500 (25in to the mile) the flight lines will be only 220yd apart and a momentary deviation of more than 20yd from the track may result in insufficient overlap, causing a gap in the photographic coverage and so necessitating a second flight.

At the end of the 1947 photographic season the Directorate of Ordnance Survey considered that the programme of large-scale air photography then in hand in the United Kingdom demanded a fresh approach to the problem of tracking, and several different types of radio and radar aids were examined. Eventually the Decca Navigator system was selected and submitted to a series of trials. The system has the inherent quality of high accuracy and it was convenient that the English chain of navigational stations provided a readily available means of test for the particular purpose.

After the preliminary trials, aircraft of a R.A.F. squadron were fitted with Decca receivers in readiness for a full programme in the 1948 season. It is understood that the results obtained were highly successful. One example was the coverage of some 50 square miles of London at a scale of 1:2500, made in 13 sorties between May 16th and May 19th. It was possible to take full advantage of favourable weather and the entire operation was completed without a gap in the coverage. In addition to the obvious economies effected by the elimination of extra sorties to fill gaps there was an important saving in the work of handling and analyzing the prints owing to the uniformity of the strips obtained.

CIVIL AVIATION NEWS

Staffs and the Amalgamation: Internal Losses: Modernized DC-3: Russia's Airlines:

BRISTOL BREDA: *The four-Centaurus-engined Breda-Zappata 308 seen at Ciampino Airport, Rome, before its first official flight.*

AMALGAMATION ECHOES

SUBSEQUENT to the announcement of the merger of B.S.A.A. and B.O.A.C., Sir Harold Hartley, chairman of B.O.A.C., said in a statement to the Corporation staff that the decision to amalgamate the two Corporations had been taken in order to achieve greater operational efficiency and optimum utilization of the available aircraft.

There was no question of either Corporation absorbing the other, and the object of the amalgamation was to combine the best of both; the decision had been taken in the light of the route pattern and traffic offering in the areas covered by both Corporations. All the effects of the merger on the personnel of the two Corporations, including assimilation, would be agreed through the machinery of the National Joint Council. He stressed the point that, while redundancies caused by the internal reorganization of B.O.A.C. now in progress would be restricted to B.O.A.C. personnel, any redundancies caused by the amalgamation of the two Corporations would be shared fairly between them and in accordance with National Joint Council procedure.

Commenting on the Parliamentary announcement of the merger, Sir Miles Thomas, chairman-designate of B.O.A.C., said that, in accordance with the policy of the Ministry of Civil Aviation, he was making it his particular business to ensure that the trade unions were brought into the closest consultation with the management in all matters affecting the merger and meetings with the trade union representatives had already been held.

CHARTER MARKET

THE air market was moderately active at the beginning of March, and this winter's activities are understood to compare favourably with last year when very little charter business was concluded until April. The Association of Aircraft Brokers, operating on the Baltic Exchange, has appointed a committee of eight to act in a similar capacity to the Air Freight Advisory Committee which has previously fostered the air side of the Exchange. The committee will be called upon to introduce standard documents and to revise where necessary those already in existence. It will also be responsible for publicizing the work of the Baltic Exchange throughout the world and of encouraging charter operations generally. Last year some very sound groundwork was accomplished by the Air Freight Advisory Committee, as a result of which several documents were standardized.

The first occasion on which the Baltairvoy Charter Party was used was for the carriage of 6,000 lb of penicillin from London to Milan. It is understood that the original Charter Party is to be presented to the British Air Charter Association and preserved as a document of historical importance and value.

NEW ZEALAND LOSS

THIRTEEN passengers, and the crew of two, are presumed to have been killed when a New Zealand National Airways aircraft crashed in heavily wooded hills 40 miles north of Wellington. The aircraft, which was on a scheduled flight from Auckland, reported by radio when 15 miles from Paraparaumu (Wellington) Airport; no further news was received and search aircraft three hours later sighted the wreckage.

B.E.A. INTERNAL-ROUTE DEFICITS

SPEAKING at Cardiff recently in connection with the inauguration of the B.E.A. service linking north and south Wales, Lord Pakenham, Minister of Civil Aviation, said that the cost of the six months' experimental service would be about £10,000 and, although he agreed that Wales needed an air service, such a loss could not be repeated unless it was proved that the service was rendering a commensurate benefit to the peoples of Wales.

Lord Pakenham also said that B.E.A.'s operating deficit for the year 1948-49 would probably be £1,500,000 and £1,000,000 in the following year. The internal services as a whole were still losing money and some, particularly those to Scottish islands, could not be expected to pay.

PUTTING UP THE MONEY: *Three coins and one long pencil provide silent testimony to the smoothness of the four Rolls-Royce Darts in the Vickers Viscount prototype; some notes on a new variant appear on p. 333 of this issue. Lord Kershaw, a member of the B.S.A.A. board, is watching the demonstration.*

SUPER DC-3

DETAILS of the modifications proposed by the Douglas Aircraft Co. to modernize the DC-3 indicate a take-off weight of 27,300 lb—some 400 lb heavier than the original specification. Cruising speed is expected to be 234 m.p.h. Structural differences will include new outer-wing panels incorporating removable and replaceable tips. The centre-wing split flap has been extended 14in into the outer-wing panel and the ailerons are equipped with geared tabs on both port and starboard sides.

Horizontal and vertical tail surfaces have been increased in area and strengthened to meet greater design-loads. The main undercarriage wheels will be enclosed by doors when retracted and the tailwheel is partially retractable, so that less than half its diameter is exposed in flight.

Whereas the basic power plant will be the Wright 1820-C9HE nine-cylinder engine, Pratt and Whitney R-2000-5Ds may be fitted. The makers claim that the Super DC-3, as it will be called, will have a greater speed when climbing, higher ceiling, and improved take-off characteristics, stability and controls. Twenty-six and 28-seater versions are contemplated.

IRON-CURTAIN AIRLINES

ACCORDING to an analysis made by the Aviation Research Institute, Washington, and used as the basis of an article by Frederick Graham in the *New York Times*, the Soviet Union's government-operated airline, Aeroflot, operates regular services to 103 points within Russia and 16 in neighbouring satellite countries. The entire network is believed to total about 137,000 route-miles. There are about 49,400 unduplicated route-miles, the Institute estimates. Even with such a large network there are, apparently, at least eight Russian cities with a population of more than 200,000 which have no air services.

According to Graham, the Russian lines do little flying at night. Even on the 4,300-mile route from Moscow to Khabarovak, he says, the Aeroflot timetable calls for two overnight stops. This cuts down the speed of the service and at certain times of the year reduces operating hours to only seven a day.

CIVIL AIR-LIFT RECORDS

RECORD deliveries of petrol, food and oil into Berlin were achieved on two days this month by the charter companies operating on the Air Lift under the administration of B.E.A. During the 24-hr period from mid-day on March 10th until mid-day on March 11th, a total of 754 tons of cargo was flown-in by about 35 aircraft. This lift was made up of 522 tons of liquid fuel and 232 tons of dry goods (flour, potatoes, fish, coal, etc.).

This new record was broken, however, during the next 24-hr period (mid-day March 11th to mid-day March 12th), when a total load of 777 tons, made up of 503 tons of fuel and 274 tons of dry goods, was delivered. The latter record lift represents more than three times the average daily lift for January (200 tons) and more than twice that for February (376 tons).

The achievement is the more remarkable in view of the fact that only about 35 of the 49 aircraft of the fleet were operating; the others were undergoing periodic checks and overhauls.

BREVITIES

INDIAN National Airways opened a new service on March 15th from Calcutta to Karachi via Delhi. Previously a night-stop was made at Delhi, but by the new service the full journey takes about ten hours, with a stop of one hour at Jodhpur. The service provides a connection to Bombay and enables passengers from Lahore and Jodhpur to reach Bombay the same day.

* * *

In answer to a question from A. Cdre. Harvey in the House of Commons recently, Mr. G. S. Lindgren, Parliamentary Secretary to the Ministry of Civil Aviation, said that the first of the six Boeing Stratocruisers on order for B.O.A.C. was expected in September and that the delivery should be complete by the end of November. If these dates were maintained it should be possible to start a limited North Atlantic service on January 1st, 1950. Answering a further question, Mr. Lindgren said that the D.H. Comet was expected to be delivered towards the end of 1951; it was designed for use on the Empire routes and the North and South Atlantic.

* * *

When the Sabena Convairs are put into service in May they will operate mainly between Brussels and London, Paris, Geneva, Zurich, Nice, Madrid, Lisbon, Milan, Rome and Naples. Use of these aircraft is expected considerably to reduce flying time and on the Brussels-Rome route the time will be reduced to approximately three hours instead of the present six.

* * *

When the new air regulations come into force on April 1st all gliders will have to be registered and hold certificates of airworthiness issued by the Ministry of Civil Aviation instead of by the British Gliding Association. The fee for the registration will be one guinea and for the certificate of airworthiness five guineas, provided that the glider does not weigh more than 2,000 lb. The Parliamentary Secretary to the Ministry of Civil Aviation recently said in the House of Commons that the pilot of a private club glider need not hold a licence.

Air France have temporarily suspended their Paris-Amsterdam service, formerly run in conjunction with K.L.M. One extra service a week has been added to the Paris-Nice Languedoc run, and the Paris-Casablanca Skymaster service has also been increased by one service.

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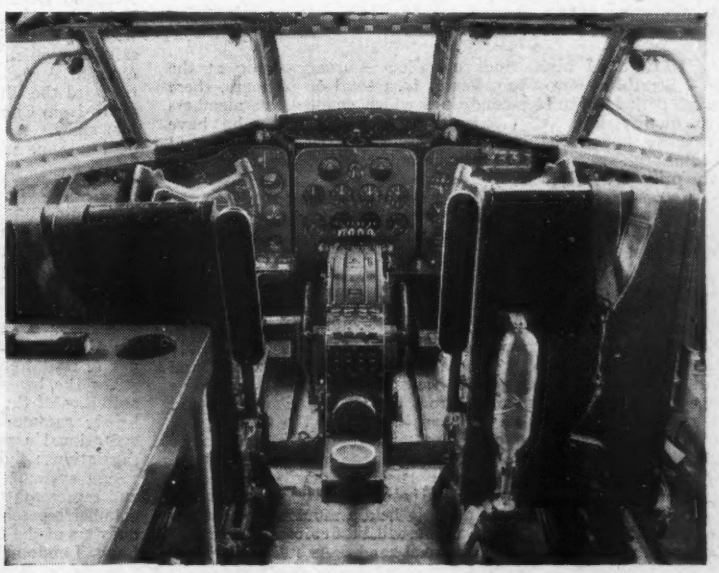
Solar Air Services, Ltd., has announced that day return flights are being operated to the principal race meetings this season. Operating from White Waltham and Croydon, the service started with the Lincolnshire Handicap. Flights leave Croydon and White Waltham before midday and return as soon as possible after the last race.

* * *

Marconi's air radio department at Croydon Airport is to be greatly extended to revive the facilities available before the war, when the Marconi main air service depot at Croydon provided service for commercial operators. Repair, maintenance and instructional facilities are to be considerably increased and a demonstration room will provide instruction in aircraft radio equipment. As part of a drive for closer co-operation



***APOLLONIAN BRIDGE:** Some of the older hands in the air transport business may raise a reminiscent smile by comparing the ultra-modern cockpit of the new Armstrong Whitworth Apollo, shown here, with that of the pioneer Argosy by the same makers. The proportions of the trim-wheels are evidence of A.W's practical approach to the pilot's problems*

Civil Aviation News . . .

between production and development sections, the staff of the air repair department dealing with sales and contracts have recently been moved from Hackbridge to the head offices at Chelmsford.

* * *

It was recently announced in Colombo by Sir John Kotelawala, Minister of Transport, that Ceylon was prepared to negotiate "on a basis of full reciprocity and on equal terms" with any international airlines wishing to operate services through Ceylon. The texts of the recent air agreements with India and Pakistan, submitted to the House of Representatives for approval, do not include the I.C.A.O. rate-fixing clause; either party, therefore, will be able to fix rates lower than those charged by international airlines.

* * *

At a recent meeting in Glasgow, the Scottish Advisory Council for Civil Aviation announced a recommendation to establish an air terminal in Glasgow for use by all airlines and jointly controlled by the City Council and B.E.A. Provisional plans have already been considered by officials of the Glasgow Corporation and B.E.A.; and the Lord Provost, Sir Hector McNeill, is to call a conference of all airline representatives.

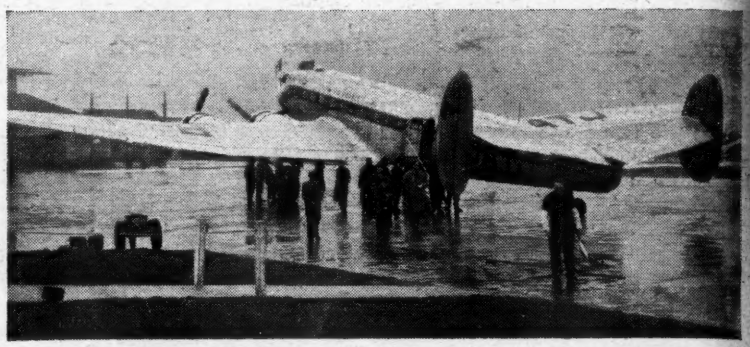
* * *

Mr. Charles H. Pentland, who was for three years officer in charge of training for the Atlantic Division of B.O.A.C. in Montreal, has now been appointed manager for the trans-Pacific operations of the Canadian Pacific Air Lines. From Vancouver he will direct the company's 16,000-mile routes to New Zealand, Australia and the Far East.

Mr. C. H. Pentland

* * *

By April 1st, American Airlines, the U.S. domestic operators, will have placed the last of their DC-3s in retirement and the fleet will then consist of 50 DC-6s and 75 Convairs. American Overseas Airlines are operating with Constellations on the London-New York service and Skymasters within Europe, but from August the Skymasters will be gradually replaced by Boeing Stratocruisers.



ADVANCE GUARD: The first four-engined aircraft to be flown on the Paris-Manchester service, this 33-seater Languedoc landed at Ringway on March 15th, replacing a temporarily absent DC-3. When the Ringway runways have been lengthened the Languedocs will go into service and fly to Paris in 1 hr 45 min.

* * *

The sixth edition of *Cloud Forms* (H.M.S.O., price 1s 3d), recently issued by the Meteorological Office of the Air Ministry, gives a full description of the internationally agreed classification of cloud types as revised by the Washington Meteorological Conference in 1947.

* * *

In the early hours of last Sunday, March 20th, one of the B.E.A. helicopters completed the final flight of the nightly series of mail-carrying tests carried out for one month between Peterborough and Norwich. No official statement has yet been made, but it is understood that the results are regarded as very satisfactory. Incidentally, in the account which appeared on March 10th three names of personnel were slightly mis-spelt; correctly, these names should have read J. S. Fay and D. H. Bryon (pilots), and L. S. Wigdortchik (assistant experimental engineer).

FROM THE CLUBS

A FLYING display and race meeting will be held at Wolverhampton Aerodrome on Saturday, May 28th. The Goodyear Trophy Race, organized by the Wolverhampton Aero Club, is to take place on the same day and will be open to all types of piston-engined aircraft flown by professional and amateur pilots. A considerable number of entries is expected, and the club will cater for some 10,000 spectators. Details of the other events are not yet available, but an interesting flying programme is being organized.

* * *

ALTHOUGH high winds curtailed February flying at the Strathtay Aero Club, Perth, to a total of 34 hours, there were periods of milder conditions which enabled five members to qualify for "A" licences. Flying members who have recently joined the club come from Dundee, Glasgow and Edinburgh—a fact which is some indication of the enthusiasm for private flying in Scotland.

A considerable number of alterations is being made to the club premises, in which accommodation for members will be improved, while offices will be provided for the chief flying instructor. With the winter social season over, members are now looking forward expectantly to the coming of evenings long enough to permit mid-week flying.

* * *

THE recently founded Orkney Flying Club is rapidly building up a strong and enthusiastic membership: already there are more than 100 members from Kirkwall alone and others from the more remote areas. It is hoped to arrange special facilities for members from the Isles of Shapinsay and Stronsay, who are taking a keen interest in the Club.

The position of the clubhouse and hangars is yet to be decided, but temporary arrangements have been made and the T.A. accommodation at Hatston has been placed at the disposal of the Club for training purposes.

Various committees have recently held a number of meetings and the flying-training programme will be finalized at the first general meeting, to be held on April 22nd. As stated in *Flight* of March 10th, a supper-dance is being held on April 15th and it is expected that Sir Basil Neven-Spence, M.P., will attend.

* * *

MEMBERS of the Yorkshire Aeroplane Club last month enjoyed a very full programme of functions, social and otherwise. On February 10th Mr. J. Taylor, of the Shell Aviation Department, gave an interesting talk on his recollections of 33 years of flying, and on the following day he flew with the C.F.I., Mr. Woodhouse, in the Slingsby Motor Tutor sailplane which had come over from Kirbymoorside. A film, *How an Aeroplane Flies*, was shown on February 16th, and on the 23rd the Club entertained twenty R.A.F. officers and their wives from Church Fenton to a hot-pot supper, followed by a film show. An international and club invitation rally will be held on June 11th to 13th at Sherburn and Monk Fryston Hall.

* * *

ASSOCIATE membership of the Association of British Aero Clubs and Centres is now available for the benefit of newly formed clubs which cannot qualify for full membership: it will enable them to obtain guidance on the standards and organizational methods adopted by the old-established clubs which constitute the present membership.

Appreciating the difficulties of embryo clubs, the Association offers the new grade of membership at a nominal annual fee of one guinea, and intends to meet the consequent deficit out of its "fighting fund."

For the benefit of club organizers not acquainted with the activities of the A.B.A.C. its services and publications may be briefly summarized as follows: Standards for technical and operational aspects of club flying; standard rules and flying regulations; flying-training syllabus and manual; aircraft servicing system; costing and accounts system; legal matters; and representations to Government departments. A reciprocal-membership scheme operates between A.B.A.C. Clubs. Headquarters of the Association are at Londonderry House, 19, Park Lane, London, W.1.

They Stoop to Conquer

Falcons for Airfield Defence Against Dangerous Bird-flocks

By David Gunston

THE recent decision by the Air Ministry to extend the experiments with falcons trained to clear R.A.F. airfields of dangerous bird-flocks marks a notable step towards solving the ever-present problem of aircraft accidents caused by birds. After encouraging trials in 1947, the R.A.F. now has a number of falcons and has been using them on Mosquito airfields in Yorkshire and Norfolk.

From purely experimental work with falcons carried out in Shropshire under the supervision of Mr. Ronald Stevens, a local representative of the almost defunct art of falconry, it was found that they had a markedly deterrent effect upon the vast flocks of rooks, plover, jackdaws and starlings which gather on any wide patches of grass during the autumn and winter months. The authorities are now convinced of the value of trained falcons in reducing the risk of accidents to aircraft when landing and taking off, and before long it is likely that many units of the R.A.F. will be equipped with their picked birds.

The problem of wild birds colliding with aircraft is, of course, as old as the history of flying. An aircraft flying at Long Beach, California, in 1910 collided with a seagull which got wedged between the fin and the rudder. Unable to steer, the pilot lost control, crashed and was killed. Since then countless aircraft of all types have been damaged or destroyed in accidents caused by birds. Undoubtedly a large proportion of the world's unsolved air disasters were attributable to bird collisions. And with the growth of air traffic such accidents have increased accordingly. At one period U.S. airline pilots were reporting collisions with birds at the rate of two or more a week, with a much higher figure during the migration season. Collisions with birds in the R.A.F. and other air forces during the war were so numerous that they led to British and American

The two photographs on this page show falcons at R.A.F. Station Shawbury, where experimental training started in 1947

A civilian falconry expert at Shawbury recalls a bird with the aid of a whistle and a lure swung on a string.

experiments to find a bird-proof windshield material.

The trouble with most bird collisions is the terrific force of impact of even the smallest bird when it strikes a fast-moving aircraft. In 1944 a small bird completely penetrated the 1½-in thick, bullet-proof windshield of a Spitfire, while an even more striking instance was that of a duck encountered at 400 m.p.h. which actually entered the fuselage through the small hole made by its own head: the four-pound bird had been compressed and forced through this minute opening at what must have been a pressure of two tons to the square inch.

From the scientific point of view, a bird striking an aircraft is a "liquid object in a fragile container" which invariably annihilates itself against the glass or Perspex of a windshield. U.S. experiments showed that ordinary quarter-inch safety glass collapses under the impact of a four-pound bird (taken as the standard weight of an airborne bird) at 75 m.p.h., which, of course, is less than the usual approach speed of most commercial machines today. Even when a windshield was not completely shattered, the impact of the bird spoilt the pilot's vision by cracking and "crazing" the glass, to say nothing of the quantity of splinters thrown off rearwards at something like 350 m.p.h.

Various alternatives continue to be put forward, notably the use of laminated glass-vinyl. A windshield of this material having plastic edges and extra strengthening devices, with a total thickness of three-quarters of an inch, will resist the impact of a four-pound bird at 300 m.p.h. The larger the pane the more it proves to be resilient and therefore bird-proof. The use of metal gratings, of two separate panes in the windshield, one behind the other,

They Stoop to Conquer . . . . .

Having sighted the lure and heard the whistle, the falcon swoops—or, in the language of falconry, "stoops."

and of a steel protecting shield for the pilot to prevent the carcases from hitting him—all these have been tried and, within limits, found to help cut down this risk of damage and accident. The Air Registration Board lays down that windshields should be of sufficient strength to withstand head-on collisions with the hypothetical four-pound bird when the aircraft is flying at the speed appropriate to climb immediately after take-off.

Birds may be encountered at almost any altitude, but they are the greatest menace at low levels, particularly when approaching or leaving the ground. Although most of the research so far has been directed at the question of birds striking cockpit hoods and windshields, they may cause equal damage by hitting an aircraft almost anywhere. Recent years have given ample evidence of the danger when birds strike engine cowlings, air intakes, rudders, gun turrets and airscrews.

But whatever mechanical precautions aircraft designers and operators may take, the problem will remain as long as birds and aircraft are in the sky together. Ever-increasing speeds, such as jet aircraft are now developing, will only serve to accentuate it. So the R.A.F. falcon experiments are of especial interest. Their outcome will be watched by those whose responsibility is civil flying, for birds menace all planes alike.

Peregrines are used, those amazingly fearless, thunderbolt-swift falcons found wild off Britain's cliff coasts. Their purpose is to scare away the bird flocks which rise at the approach of an aircraft, leaving the ground just at the most vulnerable moment. In Norfolk the reaction of gulls and other seabirds to the falcons is being especially studied, for naval aircraft have this problem to contend

Airfield guardian: a fine study of a falcon.

with in addition to their many other troubles.

The R.A.F. has trained a number of aircraftmen to its new trade of falconer. The peregrines are housed in mews on the airfields and are kept hooded and leashed to their perches when not in action. They are held on the wrist, trained to a lure and given a daily flight and a meal of dead rabbit. They prove little danger to racing or carrier-pigeons and are so trained as not to kill the bird intruders, but only to drive them out of the vicinity. Such is the ordinary bird's horror of any kind of hawk that, having been scared once by a peregrine in this way, a whole flock of several hundred birds will not return to the field for several days.

Birds caused accidents to R.A.F. aircraft costing £20,000 in 1947, while in the last year of the war, the R.A.F. suffered £120,000 worth of damage. This new method of reducing this continual risk of danger by a modern adaptation of an age-old pursuit may have far-reaching effects upon flying safety.

FORTHCOMING EVENTS

Mar. 24th.—R.Ae.S. (Isle of Wight): Brains Trust.
Mar. 24th.—The Science Museum: "The Aircraft Collection," G. Tilghman Richards, M.I.Mech.E., F.R.Ae.S.
Mar. 26th.—Edinburgh Flying Club: "At Home," Macmerry, Edinburgh.
Mar. 26th.—Rugby Football, Twickenham. The Army versus Royal Air Force.
Mar. 30th.—R.Ae.S. (Weybridge): Junior Prize Lecture.
Mar. 30th.—R.Ae.S. (Gloucester and Cheltenham): "Radar Aids in Aeronautics," Dr. S. F. Evans, M.Sc., Ph.D. At Cheltenham.
Mar. 30th.—Royal Air Force Club: Annual General Meeting.
Mar. 31st.—Royal Aeronautical Society: "Repeated Loading of Aircraft Structures," Dr. P. B. Walker, M.A., F.R.Ae.S.
Mar. 31st.—R.F.C. and R.N.A.S. Reunion, Londonderry House, W.1.
April 2nd.—British Interplanetary Society: "Astronautics and Astronomy," M. W. Ovenden, B.Sc., F.R.A.S.
April 4th.—R.Ae.S. (Derby): "Rocket Propulsion and Interplanetary Flight," A. V. Cleaver, A.R.Ae.S.
April 5th.—R.Ae.S. (Belfast): Evening of films by William Courtenay, M.M.
April 6th.—R.Ae.S. (Weybridge): "Historical Review of Aircraft Development," Sir Frederick Handley Page, C.B.E., F.R.Ae.S.
April 6th.—R.Ae.S. (Luton): Film Show.
April 6th.—R.Ae.S. (Graduates' and Students' Section): "The Trend of Jet Engine Development." A. A. Lombard, A.F.R.Ae.S.
April 7th.—Royal Aeronautical Society: "Investigation of Aircraft Accidents in Relation to Aircraft Design," A. Cdre. Vernon Brown, C.B., O.B.E., M.A., A.F.R.Ae.S.
April 12th.—R.Ae.S. (Belfast): Annual General Meeting.
April 13th.—R.Ae.S. (Leicester): Annual General Meeting and Members' Papers.
April 13th.—R.Ae.S. (Brough): "Brabazon Aircraft," F. H. Pollicut.
April 15th.—Institute of Navigation: "The Influence of Echo Sounding. A. J. Hughes, O.B.E.
April 18th.—Liverpool Chamber of Commerce: Air Display, Speke.
April 18th.—United Services Flying Club: Air Display at Elstree in aid Soldiers, Sailors and Airmen's Families Association.
April 19th.—R.Ae.S. (Graduates' and Students' Section): "The Meaning and Measurement of Stability Derivatives," P. Fink, B.E.T.
April 21st.—Royal Aeronautical Society: "High Lift Devices and their Use," R. R. Duddy, A.F.R.Ae.S.
April 21st.—R.Ae.S. (Gloucester and Cheltenham): Annual General Meeting. Followed by film "Atomic Physics," at Gloucester.
April 26th to 28th.—R.A.F. Golfing Society: Spring Meeting at Berkshire Golf Club, Ascot.
April 27th.—R.Ae.S. (Weybridge): "Present Day Problems in Safety Requirements," W. Tye, O.B.E., B.Sc., F.R.Ae.S.
April 28th.—Royal Aeronautical Society: The 37th. Wilbur Wright Lecture. "The Aeronautical Research Scene—Goals, Methods and Accomplishments," Dr. Hugh Dryden, F.R.Ae.S.
April 28th.—R.Ae.S. (Coventry): Annual General Meeting and film.
April 28th.—R.Ae.S. (Manchester): "Rocket Propulsion and Interplanetary Flight," A. V. Cleaver, A.R.Ae.S.
April 29th. to May 15th.—Paris Aero Salon.
April 30th.—No. 613 (City of Manchester) Squadron and A. V. Roe Ltd.: Air Display at Woodford airfield.
May. 2nd.—R.Ae.s. (Derby): "Lubrication of Aero Gas Turbines," J. G. Dawson, B.Sc., A.F.R.Ae.S.
May 3rd.—R.Ae.S. (Graduates and Students): "Notes on Fighter Development, 1936-1948," J. K. Quill, O.B.E., A.F.C.
May 6th.—Scientific Manufacturers' Association: Annual Dinner and Dance, May Fair Hotel.
May 9th.—Royal Aeronautical Society: Garden Party.
May 12th.—R.Ae.S. (Graduates' and Students' Section): "Pressure Cabins," D. Cardwell, B.Sc., A.C.G.I., A.F.R.Ae.S.
May 18th.—R.Ae.S. (Weybridge): Branch Members' Junior Prize Lecture.
May 21st.—Northamptonshire Aero Club: 21st Anniversary Air Display.

Retrieving Glider Cables

How No. 12 Group Gliding Club Saves Ground-time

By Wing Cdr. A. J. M. Smyth

A SHORT time ago an article* in these pages momentarily turned the spotlight on gliding-ground equipment. And since everything possible should be done to alleviate the burdens of the financially hard-pressed gliding clubs, No. 12 Group Gliding Club, R.A.F., would like to make public the fruits of an autumn's research. (For, contrary to general belief, we too have to make ends meet without assistance from the taxpayer.)

Early last year an idea was sweeping B.A.F.O. gliding clubs that cables might be retrieved by means of a small winch and a piece of string always attached to the main cable. Although I personally visited almost every club in April, I never actually saw such a device working, nor did I ever meet anyone who could describe one in detail. Therefore, as soon as No. 12 Group Club moved to our home station, bringing with it its one decrepit Beaverette, we set about improving our ground organization by the development of such a fabulous mechanism. In this we were very lucky to have with us as a member F. S. Hillyer, who not only designed and manufactured the winch, but also procured the parts at very small cost.

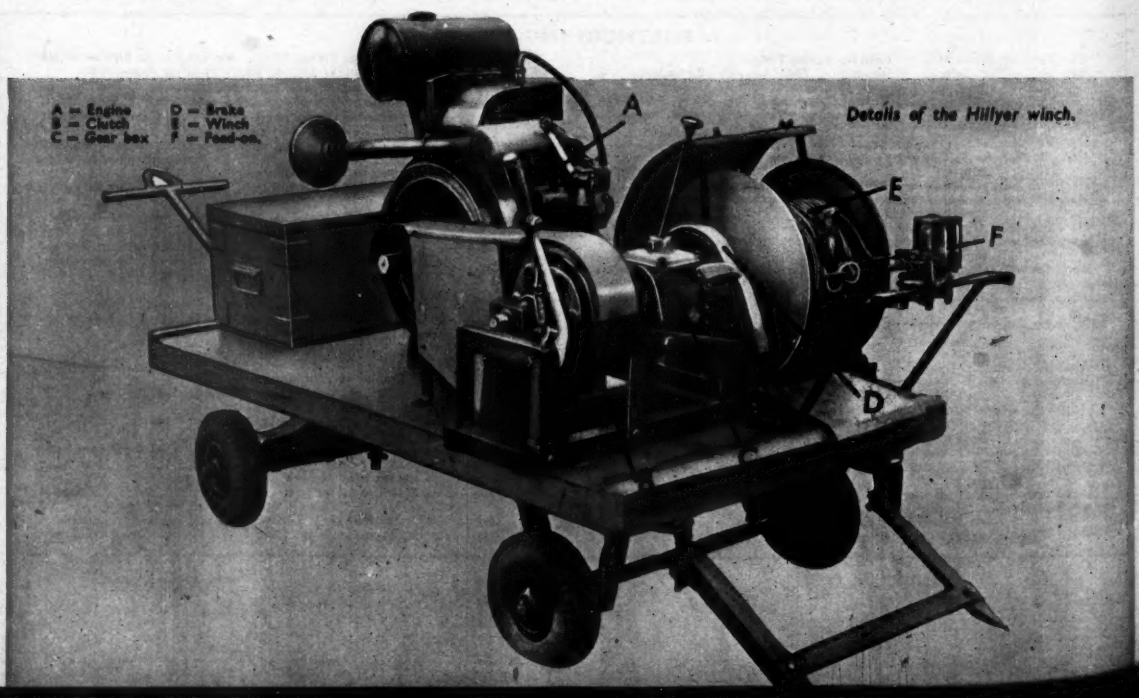
Few new developments in aviation are completed without blood, tears and sweat; this was no exception. No one knows how many times Hillyer had to start afresh as each winch proved useless, and as trial and error revealed new requirements. We know that an ideal specification should be something like this:—

(1) An engine of about 5 b.h.p. We use a Petter Type A developing 3.9 b.h.p., but this is slightly underpowered.
(2) A reduction gear. We use a twin belt drive of about 3 to 1, and this seems to give us about the right speed.
(3) A clutch to facilitate gear-changing and to provide a quick stop when winding in the cable. We use a standard Borg and Beck single plate.
(4) A gear box. When the end of the main cable is back at the main winch, little power is required from the retriever and winding may be fast. When there is a lot of main cable out much more power is required and consequently a lower gear is necessary. We use an Austin Seven gear box.
(5) A sensitive brake to prevent over-running yet so designed as not to impose friction at other times. We are now using a hand-operated band-brake, but probably some form of automatic mechanical brake would be ideal. Most of our initial troubles were due to over-running.
(6) A free-running drum of not less than 9in core diameter. If the drum centre is smaller the revs will become enormous, as the string may have to pay off at speeds up to 60 m.p.h. Smaller drums would also produce an undesirably high ratio of full to empty diameters.
(7) A simple feed-on mechanism which will not hinder feed-off.
(8) A light cord or string which will break easily in case of hang-up yet will haul-in the main cable without breaking. We find 2-lb kite-cord to be ideal. We may go back to 1-lb cord if our technique improves, but find that coarse handling still breaks even 2-lb cord. This cord or string is attached to the main cable where it joins the weak link just before the aircraft attachment.

Since modifications resulting from experiences of the early stages have been embodied in the specification as given it is not intended to refer to those experiences now. It may have been that much of our trouble was due to faulty handling, as we still find that a careless initiate can break the string; but we certainly came suddenly upon success. For circuits using up to a thousand yards of cable, retrieving takes about the same time as that during which the glider remains airborne without lift. We have done six complete circuits in 24 minutes, using one Cadet, with a pilot change in the middle. The air time was about three minutes per circuit. But allowing time for briefing we are happy to keep up an average with two aircraft of nine to ten launches per hour. Our one Beaverette is kept fully employed in aircraft retrieving.

But there are limitations which we still have to overcome. Because of engine power, we are unable to use more than 1,000 yd of cable. Not only is the Hillyer winch unable to haul 1,700 yd of our main cable, but this length of cord imposes appreciable drag on a sailplane, and costs it some 200ft of height. Moreover, the increased speed of working magnifies our signalling difficulties, and a speech link between the main winch and the Hillyer at the other end has become almost essential. We hope to use walkie-talkies for this purpose.

* *"Per Ardua ad Cumuli," by F. G. Irving. December 23rd. 1948.*



Details of the Hillyer winch.

CUTTING THE COST

—of Private Flying : Attractions of the "Communal Group"

By DAVID F. OGILVY

THE private-flying public never cease complaining about the high cost of their hobby. It is quite understandable. The expenses with which a flying club is confronted to-day are reflected in the necessarily high hourly charges, and even at these rates it is hard going, and many clubs are on the verge of collapse. Some cry for financial assistance from the Government, while others announce proudly that they will carry on regardless of difficulties; a few cannot cope, and take the easy way out.

From this, therefore, it is obvious that amateur flying has been set about in the wrong way. A sport that cannot manage without outside help is lacking something, and that something is the spirit of the flying types themselves. If we want inexpensive flying, it is there to be had if we are prepared to put our backs into it and start moving.

The Piper Cub "Viper" owned by the Community Flying Club, Reading

What is needed is the growth of communal flying clubs, or groups, as the Ultra-Light Aircraft Association prefer to call them; these can and should appear throughout the country if someone is willing to devote some spare time and energy to organizing one in each district. The time spent will be amply repaid.

What is it that prevents enthusiasts from forming such groups? Normal flying clubs find little real difficulty in gaining members despite the high rates; what is it that attracts them? Many find the bar the strongest magnet and consider flying an extra to be tolerated only when the bar is dry; such "enthusiasts" discover little pleasure in joining a communal group where the clubhouse may be a wooden hut in an isolated corner of the airfield, furnished with a few hard chairs and an oil stove.

Fifteen Shillings an Hour

There are many genuine enthusiasts who visit the clubs specifically for flying, yet, when the opportunity arrives to join a communal group, these individuals seem only too scarce. However, the groups can and do materialize; several are in existence to-day and working successfully. For example, at the Community Flying Club, which operates from Woodley airfield, near Reading, it is possible after an initial outlay of £20 to fly for the very modest figure of fifteen shillings an hour. The initial subscription covers life membership and consequently does not have to be renewed.

Often, of course, the formation of a new communal group will immediately start a vicious circle: no aircraft can be acquired until there is a reasonable amount of money in the bank, and potential members are wary of paying their initial subscriptions until there is tangible proof of the group's good faith in the form of an aircraft. However, once the enthusiasts can be persuaded to lay down their money, the aircraft can be purchased and flying can begin.

One of the snags with which the organizer will have to contend is the erroneous impression caused initially by the number of enthusiastic enquiries. When first attempts were made to form the Thames Valley Flying Group, for instance, over twenty letters arrived, yet only five members materialized. In fairness, however, one should add that in this particular case a similar club was already established in the district; the two have since joined forces.

For the group that cannot initially afford a complete aircraft of its own, a good plan is to contact a private owner who finds upkeep costs on the high side. Here an agreement can be made that is beneficial to both parties: the owner is relieved of the cost of hangarage, together with a portion of his insurance and maintenance expenses, in exchange for which the group can have a pre-arranged amount of flying time.

The writer hopes he may, perhaps, have convinced the reader that it is no longer necessary to complain about prohibitive flying costs, and that, if he can find some fellow-enthusiasts willing to co-operate, he can fly at rates within reach of the shallowest pocket—always provided he is prepared to work for it.

ATOMIC-ROCKET POSSIBILITIES

IN a recent paper given before the British Interplanetary Society under the title *Progress in Astronautics since the War*, Mr. A. W. Cleaver, A.R.Ae.S., reviewed recent American altitude-rocket experiments in relation to space-flight. It had been shown, he said, that escape velocity (11 km/sec) could be obtained by guided missiles with any of the available propellants by proper choice of the number of steps. It was fairly evident, however, that true space-flight beyond the guided missile stage would not derive from present chemical propellants and an indirect form of nuclear energy must be sought to obtain much higher exhaust velocities (e.g., of 10 km/sec or more).

Investigations had shown that rockets would still require prodigious quantities of liquid propellant—possibly hydrogen or ammonia—which would be pumped through a form of "high-temperature pile" for expulsion from a conventional nozzle system; there was also the need to provide shielding which, to protect one square metre, would weigh two to four tons and cover the whole diameter of the rocket above the reactor. Step construction might play a large part.

UNDERCARRIAGE PRODUCTION

IN our March 10th issue, when reviewing the activities of Electro-Hydraulics, Ltd., Warrington, we stated that production at this factory of main and nose landing gear assemblies for Vampires was in full swing. In this connection it should be made clear that, while Electro-Hydraulics manufacture the retracting mechanism for the nose and main undercarriages of the Vampire, they are supplied with the Lockheed telescopic leg and shock-absorber units, and with the hydraulic jacks, by Automotive Products Co., Ltd., the manufacturers of these components. Electro-Hydraulics, Ltd., then assemble the undercarriages and deliver them to the manufacturers of the aircraft.

THE TURKISH AIR LEAGUE

Training and Constructional Activities : Tailless Glider Among Original Designs

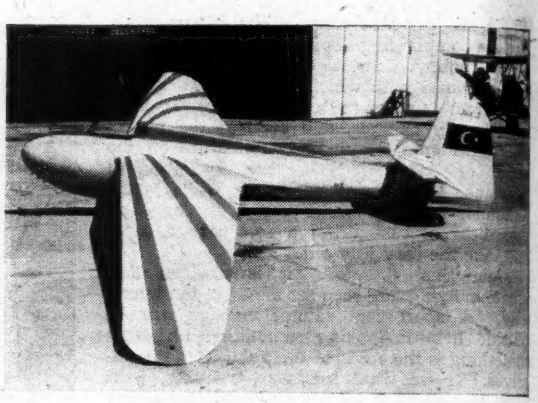
DURING recent years the Turkish Air Force has received considerable assistance from the U.S.A. and Great Britain and now constitutes one of the most powerful air forces in the Balkans. The rapid advance of Communism among her neighbours has not as yet affected Turkey to any noticeable degree and the "westernizing" policy of the Turkish Government makes Turkey one of the chief factors in the balance of power in this area.

Little known features of Turkish aviation are the activities of the Turk Hava Kurumu, or Turkish Air League, and its aircraft factory near Ankara. The movement, which was founded in 1925, is a semi-official organization designed to promote and foster the growth of "air-mindedness" in Turkey. Its considerable income is derived principally from lotteries (the League runs the only authorized lottery in Turkey) and a tax on all salaries and wages; sections and sub-sections exist in all major Turkish towns and villages. There is close collaboration with the Air Force, and the high standard of Turkish aircrews and ground personnel is due in no small part to the League's activities.

An offshoot of the Air League, the Türkkusu (Turkish Bird) Association was formed in 1935 for the purpose of building up a reserve of pilots and ground crews for the Air Force, and operates a number of schools for initial training on gliders and advanced training on powered aircraft. The founding of a domestic aircraft industry has been a constant aim of the Air League since its inception, and it played an important part in the opening of the first Turkish aircraft factory at Kaisarieh in 1927, which was a branch of the German Junkers concern. Owing to a disagreement between the Turkish Government and Junkers, the factory was shut down in 1928 but later reopened under Government supervision and, until 1940, built various types of foreign military aircraft under licence. It is now used for the maintenance and repair of Air Force equipment.

In 1941 the Air League established its own factory near Ankara, the T.H.K. Ucak Fabrikasi, the activities of which now include the maintenance of aircraft for the Turkish State Airlines, the Air Force and the Air League, aero engine overhaul, flight research, and the manufacture of aircraft of its own design and other types under licence.

For aerodynamic research: the tailless T.H.K. 13 glider.



The T.H.K. 3 with a Nuri Demirag trainer in the background.

Covering an area of some 150,000 square feet, T.H.K. employs a total of 1,200 persons under the directorship of Ing. Dip. Selâhattin Beler. At present two aircraft are in series production, the Miles Magister for both the Air League schools and the Air Force, and small numbers of the T.H.K.5A twin-engined six-seat light transport. Various prototypes are under construction and the factory produces four original types of gliders and sailplanes. Dakotas are being converted into 21-seat airliners for the State Airlines and overhaul and repair work is conducted on such types as the Dominie and Oxford, and the D.H. Gipsy Major, Armstrong Siddeley Cheetah and Pratt & Whitney Twin-Wasp engines.

A Magister for Spraying

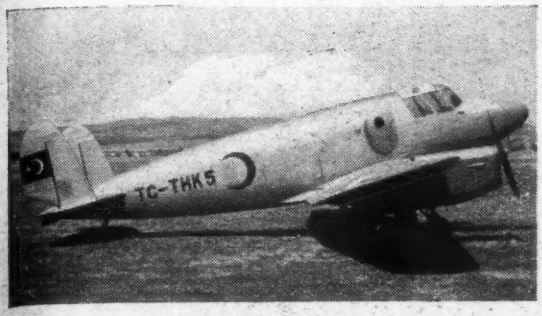
Magisters have been built under licence from the late Miles Aircraft, Limited, for some years past, and in 1946, as a result of a request from the Turkish Ministry of Hygiene, T.H.K. produced a special variant of the Magister for spraying D.D.T. to assist in combating malaria. This has the front seat faired over and is fitted with an atomiser and pulverisers, and a tank containing insecticide, which is pumped through a long pipe under the fuselage.

The first original product was the T.H.K.2 single-seat aerobatic trainer (Gipsy Major), of wooden construction, which has a retractable undercarriage turning backwards through 90 deg.

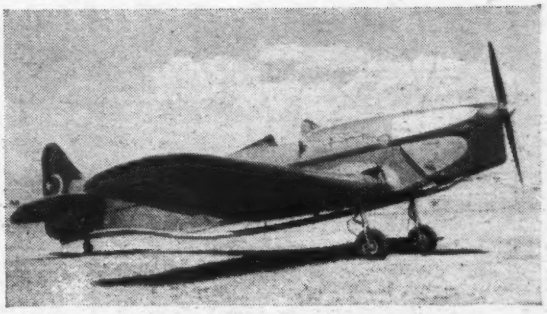
There are two versions of the League's first twin-engined

T.H.K.5 AND T.H.K.2 DATA

	T.H.K.2	T.H.K.5
Dimensions		
Span	26ft 3in	48ft
Length	23fc	32ft 9in
Height	7ft 1in	9ft 5in
Weights		
Weight empty	1,078lb	2,943lb
Weight loaded	1,452lb	4,255lb
Performance		
Max. speed	164 m.p.h.	137 m.p.h.
Cruising speed	136 m.p.h.	124 m.p.h.
Landing speed	59 m.p.h.	74.5 m.p.h.
Initial rate of climb	1,710 ft/min	—
Range	435 miles	404 miles
Service ceiling	19,685ft	13,123ft



Two D.H. Gipsy Majors power the T.H.K. 5.



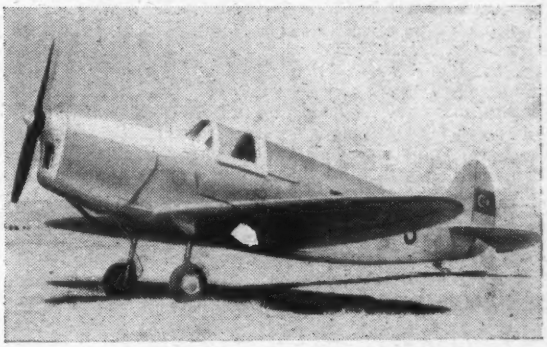
The Miles Magister adapted for spraying DDT.

design—the T.H.K.5 light ambulance with accommodation for two pilots, two stretcher cases and a medical attendant, and the T.H.K.5A six-seat light transport. Both are all-wood low-wing monoplanes, with main undercarriage retracting backward into the two Gipsy Major nacelles.

Now under construction is the T.H.K.11 high-wing twin-boom three-seat light monoplane, powered by a Gipsy Major in a pusher installation in the fuselage. A fixed tricycle undercarriage will be fitted. Estimated weight and performance figure of the T.H.K.11 are all-up weight, 2,530 lbs; max. speed, 124 m.p.h.; cruising speed, 102 m.p.h.; landing speed, 50 m.p.h.; initial rate of climb, 590 ft/min.; ceiling, 11,500ft; and range, 500 miles.

Indicative of the advanced lines along which the factory's design team are thinking is the T.H.K.13 single-seat tailless wood and fabric glider for aerodynamic research. It is planned to produce a Gipsy-powered version when the glider has successfully completed stability trials. The undercarriage consists of a single main wheel under the nacelle, and small castering stabilizing wheels attached to the vertical fins. Wing span of the T.H.K.13 is 65ft 7in, height 6ft 6½in, and wing area 431 sq ft. Loaded weight is 1,014 lbs.

Various types of training glider and sailplane are produced for the Türkkusu and, during the war, a prototype of a 12-seat troop-carrying glider was built.



Designed for aerobatic training, the T.H.K. 2.

The nucleus of Turkish Air Force pilots and ground personnel have been trained in Great Britain and the U.S.A., and their high standard, the influence of the Air League and the steady intake of modern equipment have resulted in the establishment of a well-organized air arm of substantial strength.

W. G.

Egypt-Palestine Inquiry

Sequel to the Loss of Five R.A.F. Aircraft

THE findings of an R.A.F. inquiry into the destruction of five fighters near the Egypt-Palestine border have now been published. It will be remembered that Air Ministry statements that the aircraft had been shot down over Egypt by Jewish fighters were contested by the Israeli authorities, who claimed that our machines had been firing on Jewish ground positions in Palestine. Fresh confusion was added by a report that one of the British pilots, then in Jewish hands, had admitted that the frontier had been crossed.

A summary of the evidence and findings of the court states that four Spitfire 18s of No. 208 Squadron were making a tactical reconnaissance inside the Egyptian frontier on January 7th when the aircraft flown by Plt. II Close was hit by ground fire, forcing him to bale out. While attempting to pin-point his position, the remaining three pilots were attacked by Jewish Spitfires. F/O. Cooper and F/O. McElhaw, although they were hit before realizing what had happened, managed to bale out. It is considered probable that Plt. II Sayers, who was killed, was also taken by surprise.

An R.A.F. officer who later inspected the scene testified that all four Spitfires crashed ten or more miles within the Egyptian frontier. He found the wreckage of two aircraft, which belonged to Cooper and Sayers. Local Arabs gave evidence that McElhaw and Close had been taken away by Jewish forces, who had removed parts of their aircraft and buried the rest. The inspecting officer had found fragments of Spitfires in the area, one of which had definitely belonged to Close's aircraft, and there were signs of many track and tyre vehicle movements.

While a patient in an Israeli military hospital, Plt. II Close was reported to have stated that the formation had crossed the frontier, but before the court of inquiry he said that the operation had gone according to briefing instructions, and the frontier had not been crossed. During his parachute descent he had suffered a broken jaw and concussion, and for the first six days he had been severely "grilled" by intensive questioning, usually twice a day. Finding that his recollection of happenings during this period was hazy, and that he was still under considerable mental and physical strain, the court did not feel it proper to press him. This opinion is confirmed by Service doctors.

A fifth aircraft, a Tempest, was shot down during the afternoon of January 7th, and P/O. Tattersfield was killed. His aircraft was part of a force of one Mosquito and four Tempests investigating the disappearance of the four Spitfires. The leader of the formation returned Jewish fire when attacked, but the effects of his action are not known. P/O. Tattersfield's Tempest is believed to have crashed about four miles inside Palestine, but the court considered that since it was shot down from a considerable height, it may have travelled several miles before hitting the ground.

The court found that the orders given to our pilots were clear and comprehensive: the frontier was not to be crossed; there were to be no attacks on ground forces, even if they fired on our aircraft; and no attacks were to be made on other aircraft except in self-defence. (All our aircraft carried loaded guns). These orders were fully understood and scrupulously observed. Absolute responsibility for a "deliberate and highly skilled" attack is thus placed upon the Jewish Air Force authorities.

SPECIALIZED CAPACITY

Precision and Craftsmanship at a Famous Coventry Works

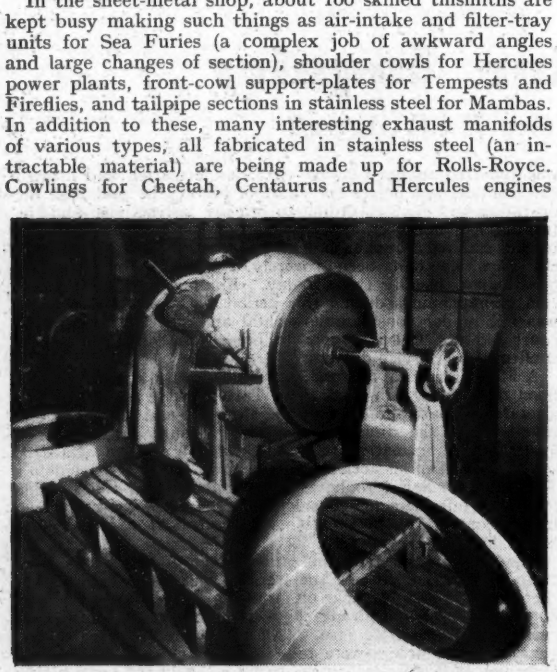
THERE have been many epochal events in the history of our civilization which, as they occurred, defined the course which that civilization was to take. Immeasurably the greatest of these was the industrial revolution, for that event was the plinth from which our whole present design of living took its shape.

In many ways a curse and yet implicit in our way of life—and, indeed, one of the prime factors which makes that way of life possible—is specialization. Specialization became essential with conversion to the creed of quantity production until, today, we have the situation where a manufacturer of, for example, an aircraft, will design the aircraft and build it, but the great majority of component parts which go to make up the finished article will have been supplied by myriad concerns, each specializing in the production of their own particular item—undercarriages, engines, airscrews, instruments, radio, and so forth.

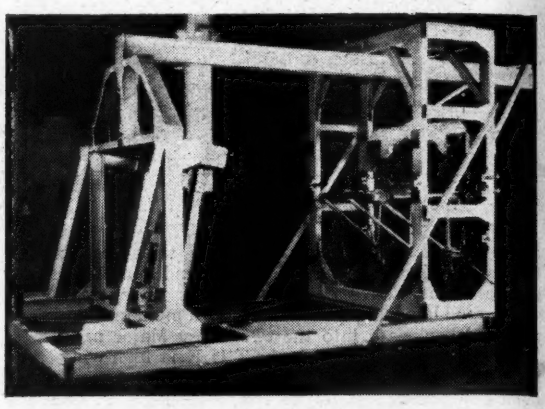
Nevertheless, although by the term specialization we normally connote application to one particular field or line, one can also quite justifiably use the term in connection with the concern whose function it is to act as a producer of experimental or individual items, or whose talents and facilities render it capable of giving specialist service. Such a concern is Cornercroft, Ltd., Ace Works, Coventry.

This is really an astonishing company, in the sense that it seems to be a microcosm of the concept that Henry Ford began putting into practice 35 years ago. That is to say, it is a quite self-sufficient unit where virtually everything required to carry a job through is done on the premises: reliance on outside aid is at a minimum. Although the major activities of the company are concerned with the car industry—standard production lines are the famous Ace wheel-discs and number plates— aviation interests run a very close second. However, it is in the experimental and jig and tool fields rather than in terms of production items that Cornercrofts chiefly serve the aircraft industry.

In the sheet-metal shop, about 100 skilled tinsmiths are kept busy making such things as air-intake and filter-tray units for Sea Furies (a complex job of awkward angles and large changes of section), shoulder cowls for Hercules power plants, front-cowl support-plates for Tempests and Fireflies, and tailpipe sections in stainless steel for Mambas. In addition to these, many interesting exhaust manifolds of various types, all fabricated in stainless steel (an intractable material) are being made up for Rolls-Royce. Cowlings for Cheetah, Centaurus and Hercules engines



Metal-spinning is a craft. Delicacy of touch and almost intuitive knowledge of materials are absolutely essential.



Typical of the larger jig-work done at Cornercrofts is this Vampire fuselage assembly jig destined for export to Switzerland.

are a Cornercroft production line, and until one sees a cowling in course of construction, the complexity and amount of detail work involved goes unrealized.

There is great contrast in the spacious lightness of the metal shop, with the staccato tapping of its many mallets, and the murky vastness of the Cornercroft foundries. These, with their attendant pattern-makers' shops, are equipped with gas-fired furnaces and offer ferrous-metal casting capacity up to 2½ tons and non-ferrous (aluminium, phosphor-bronze, brass and copper) capacity up to diameters of 5ft or the equivalent rectangular dimension. Press tools for the company's own press shop are produced in the foundries to serve the battery of double- and single-acting presses of up to 250 tons. As with many of the other departments, however, the output of the foundries is not confined solely to internal demands—a good deal of cast work is produced for the trade.

Toolroom Facilities

The toolroom is a place to gladden the heart of anyone with an appreciation of machine tools. Jig-boring is undertaken on S.I.P., Pratt and Whitney and Newall machines, whilst Keller and Reed-Prentice machines look after die-sinking requirements. Gauges, jigs, fixtures and, in fact, virtually all forms of master and precision tools are produced by the company—again, not only for their own work, but also for outside customers. To serve as an example of the range and diversity of work done in the Cornercroft toolroom, at the time of our visit we saw a magnificent die-stamp tool for producing a complicated part for an automatic telephone switchgear and, by contrast, a large, structural jig for the Vampire fuselage: this jig was but one of a series ordered for Switzerland.

Craftsmanship is a word which is so often today flagrantly misused that one almost hesitates to employ it. For one thing, it is not readily definable, but if we take it to mean the exercise of an individual skill born of an intuitive feeling for the medium, then perhaps it will serve to indicate what we mean when we speak of craftsmanship in this article.

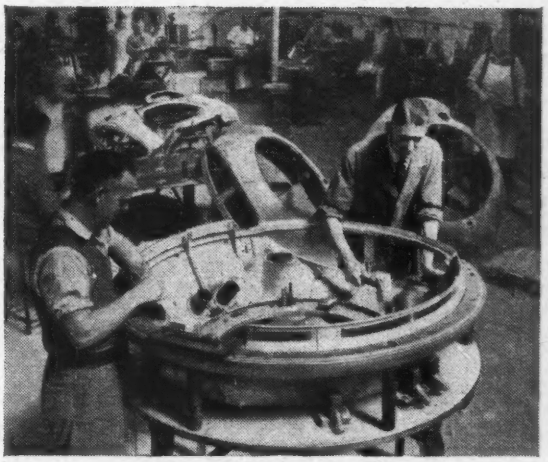
In the production of complex shapes under the tinsmith's hammer, in the caressing delicacy of the foundryman as he sculpts away any little irregularity in cope or drag, there is craftsmanship of high order. And equally as much a craft is the shaping of metal on the spinning-lathes. What the potter does with his hands, the spinner does with a variety of moulding tools—shaped metal spikes carried on long wooden hafts with which, by bearing against a fulcrum pin, he shapes the spinning disc of metal

Specialized Capacity . . . . .

exactly and accurately to the profile of the former.

Obviously, there is immense skill in knowing just what tool to use, where to press and how hard to press in order to obtain the correct shape, yet not to destroy the gauge of the material. Tolerances vary a good deal according to the particular job, yet it is common for the thickness of even large-diameter spinnings to be held within a few thous. of the nominal gauge. As with pretty well every other field of craftsmanship, there is a good deal of applied art in metal spinning. It is, incidentally, worth noting that the forms against which the spinnings are profiled are themselves cast in the company's foundries and machined and assembled in the toolroom.

Finally, there is the plating shop—one of the best installations of its kind we have seen. Almost all types of plating are undertaken here, one of the more interesting systems being the recently installed apparatus for chromium-plating light alloy. This has been a problem for some long time, but some considerable degree of success now attends the process and there is every hope that advantage may accrue in aircraft manufacture, where a deposition of chromium could well serve protective or decorative ends.



Cowlings for radial engines involve an enormous amount of hand-built detail work.

Tudor VIII Eight Miles Up

Modified Pressurization System for New High-Altitude Research

PRELIMINARY trials of the four-jet Avro Tudor VIII have been completed, and an important new phase will shortly be commenced. The purpose of the first Tudor VIII and of the small number more which are now under construction is, of course, high-altitude research. Flying to date has been concerned chiefly with the proving of the aircraft as a flying machine and the testing of the Rolls-Royce Nenes in their new paired installation.

In the near future a new test programme, involving flights up to 44,000ft—nearly 8 miles—will be undertaken. During the preliminary 30 hours in the air flights have been made at heights up to 20,000ft and the maximum true air speed which has been reached is 430 m.p.h. at 18,000ft. Previous reports quoted concerning speeds reached in excess of maximum safe speed were incorrect, confusion having arisen in the original statement between true and indicated air speeds. The I.A.S. on the 430 m.p.h. flight was 330 m.p.h., which is 10 m.p.h. less than the permitted maximum of 340 m.p.h. I.A.S. Mr. Jimmy Orrell, Avro's very experienced chief test pilot, was at the controls.

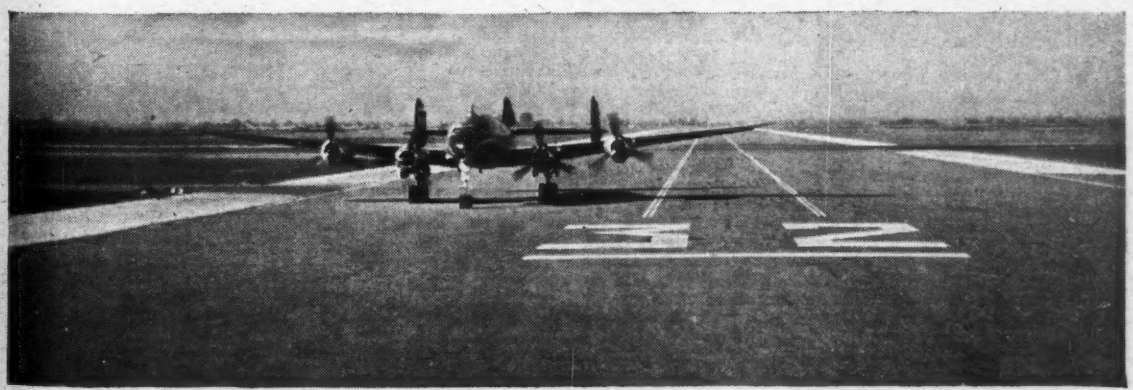
The pressurization system of the Tudor VIII is now undergoing modification. The original system for the Tudors was designed for passenger operation at altitudes not greater than 25,000ft. The pressure differential at maximum height is then about 5½ lb/sq in. An S.B.A.C. comment on the subject is that, although this does not sound a very great pressure differential, it is nevertheless equivalent to a constant pressure of 5.3 tons on a door measuring 6ft by 2½ft. The Tudor's new system is to produce a pressure equivalent to that at 8,000ft when flying at 44,000ft. This requires a pressure differential of something like 8 lb/sq in or, as a comparison with figures quoted above, a constant pressure of 7.7 tons against the door. The new pressure system will be the combined work of A. V. Roe and Normalair. Neither company under-estimates the problems which it will have to solve, but each is nevertheless tackling them with confidence.

Successful ground pressure-tests with Tudor fuselages have already been made at a differential of up to 11 lb/sq in. Hitherto the blowers used to produce the internal air pressure have been of the single-stage type, but the new requirements resulting from an increase in operating height of 20,000ft call for two-stage blowers driven by the main power plants of the aircraft. It is pointed out that it is technically possible, when gas turbines are installed, to tap air from the main compressor of the engine.

The Normalair pressure system will mostly be under automatic control and, naturally, safeguards in the form of valves and regulating devices are provided.

Although the Tudor VIII has not yet been taken above 20,000ft, other Tudors with piston engines have on several occasions been test flown at above 30,000ft, the pilot and crew using normal oxygen apparatus. It is calculated that the Tudor VIII will be capable of about 385 m.p.h. at 30,000ft.

Although this particular adaptation of the airframe is for experiment and research, it was designed as, and basically still is, a commercial airliner. The very high operating speed and altitude of which it is capable are therefore the more significant.



DUTCH RUNWAY: A K.L.M. Lockheed Constellation on Schiphol's newest runway, No. 32, which is sited in a SE-NW direction. The runway is 1,968yd long by 66yd wide. The double white lines and the figure 32 are of a special mixture of white paint and minute particles of glass, which glow when caught in the landing lights of aircraft.

AIRSCREW DESIGN

—for Transport Aircraft : Some Basic Principles Reviewed in R.Ae.S. Lecture

BEGINNING their R.Ae.S. paper with a consideration of basic requirements for an airscrew design, Messrs. Gardiner and Mullin stressed the importance of performance comparisons from all possible sources, in which connection the S.B.A.C. *Standard Method of Propeller Performance Estimation* was valuable. Use of this method made it possible to choose rapidly the best diameter, number and area of blades, together with the most suitable speed for a given aircraft design. Nevertheless when a new blade design was considered for a specific application, it was sometimes necessary to resort to one of the more laborious and detailed methods of strip analysis which made clear the effect of the separate variables involved in thrust production. Without doubt, said the lecturer, the most important design parameter was that of airscrew diameter; he emphasized that, wherever there was freedom to choose both blade area and r.p.m., the larger airscrew would always give the higher efficiency.

There were many reasons which made the final choice of diameter a compromise. With a severely limited diameter, adverse effects could be expected, such as loss of thrust efficiency at take-off and low cruising speeds, increase in noise level and, in certain circumstances and contrary to expectation, a considerable increase in weight.

For the purpose of predicting airscrew diameter, an empirical curve had been established from previous experience; a first estimate was usually made from such a curve and the result checked by more specific investigation of subsequent designs. The lecturer illustrated a typical curve and gave examples of its use.

Discussing noise and tip speed, Mr. Gardiner said that several immediate considerations, rather than those of noise, determined the number of blades; the clearance to the fuselage should not be less than about 12in, so the only course open to the airscrew designer was to limit the rotational tip speed at cruising r.p.m. to about 700 ft/sec. With turboprops, where it was economical to cruise at 90-95 per cent of maximum r.p.m., it was necessary either to increase the cruising tip speed and tolerate more noise, or sacrifice take-off thrust.

Blade Sections

Having discussed blade area, the speaker went on to consider aerofoil sections, tracing the various trends in design since the introduction of variable-pitch airscrews. Thickness/chord ratio of blades incorporating Clark Y sections had now been reduced to 6½ per cent over the operating portion of the blade and, although further reduction might save blade weight, it would have an adverse effect on performance. With N.A.C.A. 16 sections, however, the thickness/chord ratio could be further reduced with advantage. These sections, with their maximum thickness at 50 per cent chord, were convenient for hollow-steel designs, and were rapidly displacing the Clark Y section.

Use of de-icing overshoes might reduce performance by about 2 to 4 per cent for low-powered cruising but, on the other hand, severe icing might cause a drop of 13 to 14 per cent.

Discussing the question of weight, the lecturer demonstrated by use of curves that minimum weight could be achieved by the employment of four to five blades in a single-rotation hub. With hollow steel blades built about a tubular spar, the curve was of somewhat different shape, the ratio being about the same for either three or four blades. Since wider blades could be obtained merely by increasing the chord of the shell, the variation in blade weight for blade area was not large and, for a given total blade-area, the total blade-weight rose appreciably with the number of blades. Therefore, a curve of airscrew weight against number of blades for constant total blade-area and diameter showed the smaller number of blades to be the lighter: thus, duralumin-bladed airscrews tended to have larger numbers of medium-width blades, while, with the hollow steel type, the tendency was towards a smaller number of very wide blades. To obtain the maximum blade-area at the most effective radius, the tips of the steel blade were square.

IN introducing their paper entitled *The Design of Propellers*, given before the Royal Aeronautical Society last Thursday, Messrs. G. C. I. Gardiner, A.F.R.Ae.S., and J. Mullin, B.Sc. (Eng.), A.F.R.Ae.S., emphasized that, in view of the advance of the jet in the military field, they intended to confine their remarks to a consideration of airscrew design for transport aircraft. Mr. Gardiner—who read the paper, a brief summary of which appears here—is chief engineer of the de Havilland Propeller Co. Ltd., and Mr. Mullin is chief aerodynamicist.

Mr. Gardiner next examined weights of components other than hub and blades, and went on to review the progress of standardization of designs in respect of blade diameter and root size.

Explaining the basic diameters established by leading makers, the lecturer said that hubs were required to fit the basic root sizes corresponding to those diameters. Ideally, it might be best to have a series of both three- and four-bladed hubs, but as the airscrew became a more and more complicated mechanism, it seemed more practicable to limit airscrews of the larger diameters to the four-bladed type.

Stresses were considered by Mr. Gardiner in some detail. As regards steady stresses, the lecturer said that for a typical airscrew, 16ft in diameter, the centrifugal load on each blade was approximately 60 tons, and the centrifugal twisting moment might amount to 13,000 lb in for each blade at maximum take-off r.p.m.

By reason of their nature, the magnitude of the steady forces could be accurately determined and, if it were not for vibratory stresses, a considerable reduction in the safety factor, and consequently in weight, could be achieved. In a great many cases it was the vibration stresses which would decide the scantlings of the blade and the main structural components of the airscrew. In the initial stages a laborious programme of trial and error was necessary to establish the permissible vibration-stress limits.

The only true measure of vibration stresses was that recorded in flight on the actual aircraft installation under all conditions; it could be shown that a strain-gauge test on an airscrew, made in a test hangar, would bear little resemblance to the final results in flight—in some cases, the stresses recorded would be far greater, by reason of turbulence in the test hangar.

Materials

The lecturer next went on to review materials. For the airscrew blade the range of materials was a wide one, comprising high-density impregnated wood, magnesium alloy, aluminium alloy and steel. The main criteria for blade material were a high stiffness/weight ratio, ability to withstand fatigue stresses, high resistance to erosion from stones, gravel, sand and water spray and, to a somewhat lesser extent, ease of repair.

The main advantages of the impregnated wood blade were that it was light and that a considerable degree of internal damping could be obtained, which reduced the general level of the vibration stresses. The lightness was sometimes offset by the weight of the steel fittings necessary to enable the blade to be retained in the airscrew hub against the action of centrifugal force. Blades of this type were very susceptible to climatic conditions.

Magnesium alloy must be rejected on the score of its poor resistance to fatigue stresses in the presence of surface erosion, which could not be controlled and was always present on the outboard sections of the blade.

Aluminium alloy was perhaps the most widely used blade material, and could be said to fulfil all the design requirements up to a diameter of about 15ft. Since the natural frequencies of blades fell with an increase in diameter, the need for keeping the resonance of fundamental nodes outside the operating range made it imperative to increase the stiffness/weight ratio in the larger diameters. This demanded the development of a blade in which the section modulus of the blade could be varied at will, without major change to the weight.

Steel, as a material suitable for hollow-blade manufacture, had been chosen because of all materials it lent itself more readily to fabrication, and its surface was more capable of withstanding abrasion, because of its superior hardness.

From a consideration of engine speed control, feathering and reversible pitch, the lecturer passed on to his conclusion, that the trend in the future, for the larger types of airscrew, was towards a fully self-contained unit with its own oil supply and complete freedom from rotating oil transfers.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

BOMBER COMMAND REUNION

Two Minor Criticisms

I SHOULD like to put on record the thanks of all of us who attended the Bomber Command Reunion to the organizers and artists who helped to make a good show. However, I must level a certain amount of criticism at both sides—with the possibilities of being "pranged" by both.

First, to the organizers: we were sadly disappointed that the show closed as early as it did and in such a manner, with no "flarepath"; there was not enough time to meet old comrades. Secondly, to the "boys"; the excessive amount of broken glass was, I am sure, not necessary. EX-F/S. N. HOOPER.

Ashford, Mddx. (No. 10 Squadron.)

A "Fighter" Function Suggested

IN view of the great success of the Bomber Command Reunion at the Albert Hall on 12th March, kindly sponsored by the *Evening News*, would it not be possible to organize a Fighter Command Reunion on the same lines? If you could find room to publish this suggestion perhaps "some kind gentleman" would come forward with the necessary!

R. E. GREEN,
ex-Squadron Leader.

South Harrow, Mddx.

NOMENCLATURE

Seadromes and Flying Ships

IN a recent letter to *Flight* Mr. Simon Warrender suggested the adoption of the words "flying ship" and "seadrome" for large flying boats and aviation marine bases respectively.

I should like to support his comments concerning the latter. What could be more unromantic than "Berth 50" as a name for the home of the B.O.A.C. flying boats which have won so much public admiration? "Berth 50" suggests that one is to travel by the lately notorious banana boat or some other equally depressing mode of transport. The present term is so unimaginative, whereas "seadrome" suggests something luxuriously clean and modern—such as "Berth 50" really is. The Americans are apparently using "seadrome" in official Senate reports, so let us take the opportunity of importing something that will not cost us any dollars.

However, when we come to "flying ships," I can no longer side with Mr. Warrender. Why on earth must we rename a transport, of earth, sea or sky, just because it grows bigger? Do we call the Queens of the Atlantic "floating cities," or the Bristol 170 a "Flying lorry"? Both the Saunders-Roe boat and Mr. Warrender's Sponson Tribian are flying boats. One is very big, so Mr. Warrender suggests that we should liken it to a ship; the other is small—shall we, then, call it a flying row-boat or dinghy?

Reading, Berks. JOHN S. WEBB.

THE SOUTH-AMERICA SERVICE

Use of Solents Urged

NOW that the Tudor affair is over, there is only one aircraft which can quickly restore British prestige on the routes to South America. That aircraft is the Solent. With only one fatal accident since the war, British flying boats have an enviable reputation for safety as well as for comfort. Many people will think that, in the baffling circumstances of the Tudors' disappearance, the ability to make a successful alighting at sea, or at the very worst a comparatively easy and gentle ditching, might well have saved the lives of all on board.

Flying-boat travel is already very popular in South America, where the Sandringham has proved an outstanding success and is still being ordered; but the more passengers come to regard it as the natural way of crossing the Atlantic, the greater will be the success of the magnificent Princess Class, on which the country's long-term hopes in civil aviation so largely depend.

Very little work would be necessary to develop bases along the route, since the majority are already operational, and they will, in any case, be required in two or three years' time when the Princess Class will be starting to take over the through traffic.

Our airlines, to make money, must, above everything, achieve a high load factor. That means they must be the first preference of every prospective passenger. We can never bring this about by providing a service with machines similar to or identical with those of the American, French, Dutch and Scandinavian companies. If we offer something different, characteristic of our tradition and uniquely attractive, every traveller who prefers to cross the ocean in a seaworthy vessel will make it his first choice.

Here is our chance to provide—with British aircraft—a service no competitor has the means to equal. Are we to fumble it as we have fumbled so many other opportunities in the last few years? CHRISTOPHER BLACKBURN.

London, N.3.

AN AERONAUTICAL MUSEUM

More Support for a Reader's Suggestion

I WOULD like to add a few words of agreement with Mr. Geoffrey Dorman's letter (March 3rd) on the desirability of urgently establishing a museum of aeronautics. It seems to me (and I claim some experience since those 1909 days) that relics, photos, records should be preserved and made available to the present younger generation and for the man in the street.

To be quite candid, I find that on producing any documents, photos, etc., of the years gone by one is looked upon as a crank or hoarder for possessing such old records. Surely it is owed to the pioneers, aviators, directors and men in the factories that some museum should be arranged to show more than can be seen at South Kensington, though, granted, the exhibits at the latter are better than none at all. I also claim that the Government should give its support.

History is soon forgotten, and even some of the early R.A.F. (formerly R.F.C.) Squadrons are appealing to those who possess old photos, records, etc., of their early history.

Let us have some more opinions from your readers.

Bristol. H. S.

THE 600-m.p.h. BOMBER

Are We Backing the Wrong Horse?

MAY one suggest that the success of the jet and turbine in giving us speed might be destroying our vision in more important matters? What are these bombers designed to carry? The answer, presumably, is bombs. What kind of bombs? Surely they will be atomic ones, since it is unlikely that we shall waste valuable machines and men in carrying the now comparatively harmless kind we were using at the end of the last war.

We are told that the latest "atomics" are many times more destructive than the Hiroshima ones, that devastation over some 50 miles' radius may be expected, and that America is building up a pile of them (which is comforting to know).

With these bombs, what is the advantage of 600 m.p.h. over, say, 300 m.p.h.? For example, if our battle-ground is Europe one would imagine we could take any old 300 m.p.h. machine, discard the pilot and crew and the guns and armament, then load it with one atomic bomb and send it out over Europe with automatic pilot or under radar or radio control from England. It could fly at tree-top height if desirable, and have special markings or a siren to indicate it was carrying an atomic bomb.

What would happen does not need much imagination. Can we believe that anyone would want to shoot it down, knowing of devastation 100 miles in diameter? More likely would we find the whole population, civil and military alike, down on its knees praying to the Almighty that the aircraft might be left severely alone till it had gone somewhere else! And supposing a machine like this were on its way to England and we located it by radar—would we send out pilots to certain death, would these pilots be volunteers, and would we be justified in exploding the bomb over neutral or allied territory?

In considering matters like this the writer has the temerity to suggest that our bomber programme is already out of date, since it depends for its success upon the human element under conditions with which the human element will be unable to cope. With any one bomb wrecking every other plane within 50 miles of it, timing and accuracy and quick decisions on new routes and change of plans and programme, together with the increasingly difficult operations against attack, already indicate that bomb dropping will have to be carried out by

Correspondence . . . . .

remote control, using instruments far away from the actual scene of destruction.

It is now some five years since we luckily spotted the great German experimental organization at Peenemunde and destroyed it. There they had made a beginning with the V-1 which was destined mainly to attack London. What could those same German scientists have done during the subsequent five years with possession of the atomic bomb, the lessons they had learned from the V-1 and with peacetime freedom for development? In the meantime, our great technicians in this country are using the success of the jet to try to exceed the speed of sound, with doubtful advantage when they have done so, seeing that already the V-2 type at over 3,000 m.p.h. has shown us what might eventually accrue in this direction!

For the moment, and with the knowledge and resources we can call upon *right now* we ought to be able to replace the big and expensive "long-term policy" bomber with a simpler pilotless and crewless atom-bomb "delivery plane" to be launched from somewhere in this country and controlled by instruments to its destination, having due regard to the fact that we do not need any more "pin-point" bombing on any particular small target.

It could be a "one-way" machine with rocket assistance to a great height. The pressurized cabins and armaments and crews and undercarriage and the mass of impedimenta could be dispensed with, it could send back pictures of the ground it is travelling over and the "pilot" would all the time be sitting in his sound-proof basement with instruments and charts and receivers in front of him. The bombs would, of course, be made harmless until they were some hours' distance from their launching base. We might also build pilotless reconnaissance machines to take photographs from a low height and either radio them or bring them home.

Is it too much to ask that some pilotless "atom carriers" be put in hand immediately for tests over the Atlantic? We have good reason to believe that many of the German experts who were in advanced stages in this class of work have been working for the Russians for some years. May one hope that the writer is "speaking out of turn" and that such machines are already on the way?

Petworth, Sussex. GRANVILLE BRADSHAW.

EX-NAVAL PILOTS

"Unwanted" by R.N.V.R., Welcomed by R.A.F.V.R.

I WOULD like to add my voice in support of Messrs. Prouting and Warrender's recent letters regarding ex-naval pilots. Having flown for four years in the service of the Royal Navy, I was demobilized full of keenness to continue flying with the R.N.V.R. During the past three years I have repeatedly applied to the Admiralty to fly with a Reserve Squadron. As there is only one such squadron for the whole of London and the South, the only satisfaction I have received is that my name now adorns both long and short waiting lists for that squadron. Fifteen months ago I turned, in desperation, to the R.A.F.V.R., where I was welcomed with open arms. I deeply regretted and still regret the necessity of having to sever completely all connections with my "mother" service in order to take an active part in the nation's reserves.

The R.A.F.V.R. flying school to which I am attached is the same school at which I did my E.F.T. whilst in the Royal Navy. Surely, if R.N. personnel could train with the R.A.F. during war, they could "keep their hand in" with the R.A.F.V.R. during peace. At this school there are several ex-naval pilots who are still extremely keen, and at a recent ground lecture, held during a wintry spell, 25 per cent of those present were ex-naval.

Whilst being most grateful to the R.A.F.V.R. for being allowed to fly with them, I abhor the Admiralty's indifference to its ex-pilots who are keen to see a strong and efficient Naval Air Reserve.

H. G. TANNER,
F/O. R.A.F.V.R.,
Ex-Lt. (A) R.N.V.R.

Bexleyheath, Kent.

PROTOTYPE-ENGINE DEVELOPMENT

What It Costs

I HAVE just read the article "Introspection" in *Flight* of March 3rd, and I am amazed by the remarks attributed to A. Cdre. Banks. He instances £55,000 as the cost of developing a 3,500 h.p. prototype-piston engine, and £58,000 for a turboprop of similar power. I'll not contest the comparison, for I have no idea of what this is, but I do most certainly contest his statistics.

The figures he quotes would be no more than a mere fraction of the expenditure necessary to develop such engines; £580,000 would be a little closer to the actual figures. At least three years would be spent in development before the successful running of the prototype, and this would cost at least £500,000 in wages alone, quite apart from all the other numerous expenses entailed.

If A. Cdre. Banks' figures *were* correct, how much happier would be the aircraft industry to-day!

Morden, Surrey. F. K. GOULDING.

[We have asked A. Cdre. Banks for his comments, which are as follows.—ED.]

"I assumed an active firm, already in being, with the necessary experience and technical and manufacturing personnel. I also assumed that the cost in question only covered the design and manufacture of one (the first) prototype engine.

"In order to take this prototype through the development phase, to the point where it can be successfully type-tested, would involve a further number of engines, i.e., at least ten or a dozen; and this, together with anything from 5,000 to 10,000 hours of development testing, comes to considerably more than Mr. Goulding's figure. In fact, with the number of samples of the prototype required during the development phase, and according to the complexity of the individual engine, the final figure can be anything between £1,000,000 and £2,000,000.

"If, therefore, Mr. Goulding had read my Bleriot article, he would have seen that the figures quoted in the article of your issue of March 3rd were actually for designing and building a prototype engine and not for its subsequent development.

"There is, also, the extreme case where a firm with no previous experience of aviation engines has received a contract for the design and manufacture of a new engine; and where one engine, before development, has cost about £250,000. The reason for this is that the single prototype engine has to bear the cost of running practically the whole firm."

BOOKS RECEIVED

Aircraft Power Plants, by the Technical Development Staff of Northrop Aeronautical Institute. McGraw-Hill Book Co., Ltd., 36s.

The Measurement of Stress and Strain in Solids. Institute of Physics, 17s 6d.

Aeromodeller Annual, compiled by D. J. Laidlaw-Dickson and edited by D. A. Russell, M.I.Mech.E. The Model Aeronautical Press, Ltd., 7s 6d.

Flight to Freedom, by J. V. Hewes. Hammond, Hammond and Co., Ltd., 8s. 6d.

Aviation Medicine in its Preventive Aspects, by John F. Fulton, O.B.E., M.D., D.Sc. Oxford University Press, 12s 6d.

A Textbook of Radar, by the Staff of the Radiophysics Laboratory of Australia. Chapman and Hall, 50s.

A.B.C. of Airports and Airliners, by Owen G. Thetford. Ian Allan, Ltd., 3s 6d.

BA Aluminium Paste. The British Aluminium Co., Ltd.

World Aviation Annual, 1948, published jointly by the Aviation Research Institute, Washington, D.C., and the James Jackson Cabot Professorship of Air Transportation of Norwich University, Northfield, Vermont.

Palmer's Company Guide, by J. Charlesworth, LL.D. Stevens and Sons, Ltd., 6s 6d.

The Army Air Forces in World War II, edited by W. F. Craven and J. L. Cate. Cambridge University Press, 27s 6d.

One Story of Radar, by A. P. Rowe. Cambridge University Press, 8s 6d.

Smatterbook Number 10—100 Facts on Flying. General Editor, Charles Graves. The Naldrett Press, 6d.

Annual Report of The Smithsonian Institution, 1947. United States Government Printing Office.

Air Transport Navigation, by Peter H. Redpath and James M. Coburn. Pitman, 25s.

The Theory and Use of the Complex Variable, by S. L. Green, M.Sc. Pitman, 12s. 6d.

Still Binding with Cheque-Mate!, by Richard Barker. The Punch Bowl Press, 3s 6d.

Rockets and Space Travel, by Willy Ley. Chapman and Hall, 18s.

The Helicopter, by Colonel H. F. Gregory. George Allen and Unwin, Ltd., 18s.

Model Aeroplane Handbook, by F. J. Camm. George Newnes, Ltd., 12s 6d.

The Air League Book. Published by Foley House Press for the Air League of the British Empire, 12s 6d.

Control Line Flying, by R. H. Warring. P. Marshall, 10s 6d.

SERVICE AVIATION

Royal Air Force and Naval Aviation News and Announcements

FEATHERED ENEMIES: *The danger to aircraft of bird-flocks—emphasized in in an article in this issue—is apparent in this study of a Coastal Command Lancaster taking off from Gibraltar during the recent Fleet exercises held in the area.*

"V.R." Concession

CIVILIANS without previous service experience may now join the R.A.F.V.R. if they have flown 110 hours as pilot, navigator or signaller, and are up to basic training standards. Age limits are 18 to 30. Qualified pilots, navigators and signallers are accepted for R.A.F.V.R. flying training up to the age of 38, or up to 41 in special cases.

Weekly Pay for R.A.F.

THE Air Ministry announces that, as soon as possible, airmen will be paid weekly instead of fortnightly, although shortage of clerks and accountants may cause delay.

To assess the extra work and manpower involved, a trial, lasting some months, is being made at one station in each R.A.F. Command at home, in B.A.F.O. and in 90 Group. The stations chosen are Henlow, Leuchars, Hullavington, Rudloe Manor, West Raynham, Watton, Upwood, Abingdon, Stafford and Wahn (B.A.F.O.).

Scottish Air Defence Exercises

THE air defences of central Scotland were recently tested in a nine-day series of exercises recently. The A.O.C. No. 12 Group, Fighter Command, A.V-M. Harcourt-Smith, C.B.E., M.V.O., was in charge of the operations, which included raids by U.S.A.F. Superfortresses from their bases in East Anglia, and Fighter Command Hornets.

Sea Furies and Fireflies from the carrier H.M.A.S. *Sydney* at the Firth of Forth joined with Meteors, based at Leuchars, and Spitfires in high-altitude attacks on the raiding aircraft. During the closing stages of the exercise the Hornets turned to low-level sweeps against the defenders' airfields. Valuable practice was provided for both air and ground defences, who claimed a large number of successful interceptions.

After a tour of the defending forces, Air Marshal Sir William Elliot, K.B.E., C.B., D.F.C., A.O.C.-in-C. Fighter Command, paid a special tribute to the work of the Royal Observer Corps, whose work, he said, had been invaluable.

Berlin Air Safety Centre

THE only quadripartite air operations room in Germany—the Berlin Air Safety Centre—has just completed three years of unbroken day and night watchkeeping. The Centre is the joint responsibility of Great Britain, the U.S.A., France and Russia; a quarter of the staff is British and is drawn from the British Air Forces of Occupation.

Established in February, 1946, the Centre is housed in the Allied Control Authority Building, not far from the Potsdamer Platz; a network of telephone and teleprinter lines connects it with the eight main airfields in Greater Berlin, various Allied control offices, and the main operations room in the Western Zones. The four Powers are represented on each watch by a controller and appropriate staff, and all aircraft movements are pooled. B.A.F.O. headquarters is kept informed of all Russian movements, and in return the Soviet controller is notified of all British traffic.

As the accepted quadripartite controlling body for the Berlin Control Zone, the Centre was originally responsible for co-ordinating the heights and times of all aircraft entering or leaving the Zone. The British Element also had to ensure that aircraft entering the two western corridors complied with the height regulations. The immense increase of traffic brought about by the Air Lift, and its organization under joint Anglo-American control, has since led to the introduction of permanent set heights for various classes of traffic. Occasionally, on the urgent request of a pilot, a prevailing height may be changed, but only

HORNETS' NEST: *A scene from Linton-on-Ouse, the base of the Hornets which operated at both high and low levels during the Forth-Clyde exercises.*

Service Aviation . . . . .

with the knowledge and approval of B.A.F.O. headquarters.

Thus the Air Lift, while bringing to the Centre a great increase of work, has also, in effect, made the work more of an automatic or routine nature. All Air Lift take-off times from the west are telephoned to the Centre, which forwards them to the airfields of destination. Each individual movement is also shown to the Soviet controller. Outgoing traffic is dealt with in the same way. To save time, information on each flight plan is confined to the type of aircraft, its call-sign and its departure time. For all non-Air-Lift aircraft, such as the regular Transport Command flight from London to Warsaw, a full flight plan is still required. The Centre has handled up to 1,800 aircraft movements a day.

A number of "foreign" machines regularly visit or fly over Berlin, and have to be dealt with by the Centre. For example, the Polish Lot airline operates a twice-weekly schedule from Warsaw to Paris. Such aircraft contact the Centre through the Signals Section at Gatow to exchange information when about to enter the corridors. Another duty of the Centre is to act as an information bureau for official departments seeking news of important incoming visitors, or members of the public requiring news of aircraft.

R.A.F. Appointment

AIR COMMODORE E. C. FARMAN, who has been A.O.C. No. 42 Group, Maintenance Command, since July, 1947, has been appointed Director of Equipment (B) at the Air Ministry. His place with 42 Group will be taken by A. Cdre. C. W. Gore, O.B.E., until recently Deputy Director of Equipment.

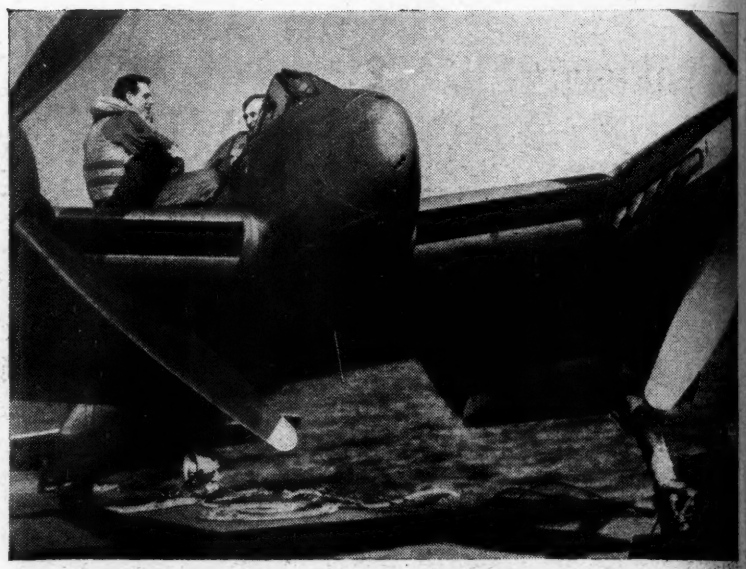
R.A.F. Yacht Club

AT the annual general meeting of the R.A.F. Yacht Club, held in London recently, the following Flag Officers, were elected: *Commodore:* A.V-M. P. H. Mackworth, C.B.E., D.F.C.; *Vice-Commodore:* G/C. E. F. Haylock, R.A.F. (Ret.); *Rear-Commodore:* S/L. A. M. G. Lywood, D.F.C.; *Secretary and Treasurer:* S/L. F. G.McIntosh.

Membership is open to ex-officers of the R.F.C., R.N.A.S. and W.A.A.F., and past and present officers of the R.A.F., R.A.F.V.R., and W.R.A.F. The headquarters are at Calshot, overlooking Cowes and the finest part of the Solent, and the premises, which are licensed, are right on the foreshore. The club provides a unique opportunity for those interested in sailing and yachting not only to learn to sail, but to spend a holiday in delightful surroundings at a very reasonabe cost. Accommodation is available in the club for members, and there is a separate wing for ladies. The annual regatta—to be held this year on Saturday, August 13th, at Calshot—is, incidentally, one of the highlights of the Solent season.

Boats available for charter to members at reasonable rates include 50 and 30 sq metres with sleeping accommodation for six and four people respectively. Day boats, such as the X Class, can be hired for racing, picnicing and day sailing.

The annual subscription is at present very low and new members can be accepted; a reduced subscription is available for cadets. Enquiries should be addressed to the Secretary, R.A.F. Yacht Club, Calshot, Hants (Fawley 231).



NAVAL LIAISON: Lt. Cdr. W. Sampson (left) of the U.S. Navy is one of two pilots shown aboard H.M.S. Implacable during a quieter period of recent Fleet Exercises off Gibraltar. In the cockpit of the Sea Hornet 20 is Lt. (A) R. Shilcock, R.N.

Western Union Appointment

COLONEL N. LEBOUTTE, Director of Operations of the Belgian Air Force, has been appointed to the staff of Air Marshal Sir James Robb, C.-in-C. Air Forces, Western Europe. During the war, Col. Leboutte served as a wing commander with the Belgian section of the R.A.F.

Far-East Football

IN a match played recently at Bangkok, the R.A.F. Air Command Far East Soccer team beat the Royal Siamese Air Force by three goals to two. The R.A.F. team flew from Changi for the game, which was watched by a crowd of about 6,000. Scorers for the R.A.F. were A/C. W. Durden (two goals) and F/L. Syrett (captain).

Triple A.F.C.'s Retirement

ONE of the few holders of the Air Force Cross and two bars—A.V-M. T. A. Langford-Sainsbury, C.B., O.B.E., D.F.C., A.F.C.—has retired from the R.A.F. He is one of only four officers to be so decorated, the others, also retired, being G/C. P. W. S. Bulman, G/C. H. J. Wilson, and W/C. W. R. Read.

A.V-M. Langford-Sainsbury, who was Air Officer in charge of Administration, B.A.F.O., Germany, until his recent retirement, was awarded the A.F.C. in 1919 for his work with home air defences towards the end of the first world war. He gained a bar two years later for his services as a test pilot at the R.A.E., Farnborough. The second bar, awarded in 1937, was for his part in development work which led to the introduction of general reconnaissance squadrons in the R.A.F. He won the D.F.C. in 1924 for operations in Kurdistan.

During the recent war he served with No. 201 Group, Coastal Command, in the Middle East, and finally as A.O.C., Egypt. After the war he was S.A.S.O. at H.Q., Bomber Command, until his posting to Germany, where his brother is now C. of E. Chaplain to B.A.F.O.

R.A.F. Permanent Commissions

GENERAL DUTIES BRANCH.

Squadron Leaders: I. G. O. Fenton, D.F.C., C. Marshall, M.B.E., J. D. Mundy, D.F.C., R. G. W. Oakley, D.S.O., D.F.C., D.F.M., K. C. Roberts, A.F.C.

Flight Lieutenants: W. G. Abel, B. Beard, D. H. Chopping, D.F.C., D. S. J. Clark, E. S. Davis, G. H. Davis, D.F.C., G. T. Donaldson, T. R. W. Froud, D. F. Hanson, A.F.C., K. E. Hellings, J. E. Herridge, G. Honeyman, R. T. Johnson, W. J. Marriott, W. H. Mills, K. C. D. Nixon, R. A. Parfitt, R. K. Parkinson, P. Porter, B. C. Redman, R. D. Steinbach, R. R. Stowe.

Flying Officers: J. C. Cottam, J. J. Hughes, E. G. P. Jeffrey, R. M. Jenkins, R. J. Saker, N. G. Townsend, D.F.C., R. R. Wilson.

TECHNICAL BRANCH.

Flight Lieutenants: J. T. Adey, J. G. Alderson, D. D. Barber, J. T. C. Byrne, G. A. Crabb, W. H. Dainty, J. W. Miller, R. F. Plucknett, H. R. Rees, F. J. Willgress, D.F.C.

Flying Officers: P. Biegel, B. W. Firth, E. J. Regan.

EQUIPMENT BRANCH.

Flight Lieutenants: W. M. B. Farrow, G. H. Norrish, C. B. M. Shevlin, D.F.C., D.F.M.

Flying Officer: A Grayson.

SECRETARIAL BRANCH.

Flight Lieutenant: G. R. Clark.

AIRCRAFT CONTROL BRANCH.

Flight Lieutenants: W. J. Gregory, D.S.O., D.F.C., D.F.M., J. C. Inkson, J. F. Turner.

Flying Officers: C. H. Lowne, H. F. Orchard.

Reunions

FORMER crew-members of the airship R.34 who were based at Pulham, Norfolk, and are interested in a proposed reunion in Norwich are asked to contact W. Pickering, the Police Station, Attleborough, Norwich.

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A reunion for all ranks of the R.A.F. who were stationed at Lindholme will take place in London on April 9th. Tickets (10s) from J. Freeland, 3, Birch Tree Way, Croydon.

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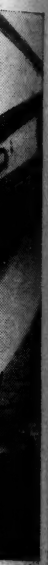

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